Noise Element Background Report

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huntington beach planning department

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REPORT

WYLE RESEARCH REPORT

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NOISE ELEMENT REPORT FOR THE CITY OF HUNTINGTON BEACH

By

H. Guido Meindl
Donald Pies

Wyle Research
El Segundo, California

For

City of Huntington Beach
Planning Department
Huntington Beach, California

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SUMMARY
NOISE ELEMENT BACKGROUND REPORT

The Noise Element Background Report focuses on noise sources in Huntington Beach - highways and freeways, railroads, airport and helicopter operations, residential/institutional sources, and oil pumping operations. The objective of the report is to reduce the degree of noise exposure from all sources in the community to acceptable levels to insure the public health, safety and welfare. Toward this end, the Noise Element Background Report examines the primary noise sources in the City, establishes desired maximum noise levels by land use category, and proposes programs to reduce noise exposure to acceptable levels.

Goals and Policies Statement

Goals and policies have been formulated to provide basic guiding principles for reduction of noise in Huntington Beach. They are as follows:

Goal

To reduce to acceptable levels the degree of noise exposure from all transportation, stationary and other nuisance sources in the community to insure the public health, safety and welfare.

Objectives of the Plan

- To coordinate intergovernmental efforts to abate noise.
- To reduce the impact of noise from all types of aircraft.
- To reduce motor vehicle noise from streets and freeways through proper location and design.
- To reduce noise levels produced by all types of motor vehicles.
- To require acceptable noise levels for future modes of transportation.
- To reduce the impact of railroad noise.
- To reduce the impact of construction and industrial noise.
- To minimize external noises and prevent them from penetrating quieter uses.
- To abate unnecessary outdoor noises.

because of the many variables involved, such as differing human response to noise, and the range of activities within each land use category having varying sensitivities to noise.

Maps showing potentially noise-sensitive areas are also being provided as part of the Noise Element Background Report (see pages 64, 65, and 69). The amount of potentially noise-sensitive land is increased in many locations between the present and 1990 due to changes in land use and projected increases in traffic volume.

Random Noise Sources

Noise from constant sources (e.g., vehicle traffic, railroad and aircraft operations) can be quantified by calculating noise contours. Random noise sources cannot be dealt with in this way and must depend on analysis by field measurement. Wyle Laboratories conducted a 50-site field measurement program for Huntington Beach, covering a range of random noise source types. The measured noise levels recorded at the specific sites approximate the general noise picture for the community.

The field survey indicates that trucks on arterials are responsible for the highest noise exposures in Huntington Beach. Sources producing the lowest noise levels were typically found in residential areas away from arterials, residential areas near arterials but with barrier walls, and in school areas. Generally, the single event noise intrusions observed in Huntington Beach fell within the "acceptable" noise criteria levels.

Measurable Goals for the Reduction of Noise

The Noise Element Background Report sets forth measurable goals for the reduction of noise. Interior noise levels to which the resident would be exposed during sleeping hours should not exceed:

(a) 55 dB for more than an accumulation of 60 minutes in any 24-hour period,

(b) 45 dB for more than 30 minutes during nighttime sleeping hours from 11:00 p.m. to 7:00 a.m., and

(c) 45 dB for more than an accumulation of 8 hours in any 24-hour day.

Incorporating sound level reduction achievable from warm climate structures, exterior noise may be 56 dB for windows open and 71dB for windows closed to achieve "acceptable" levels for sleeping quarters

Suggested Methods of Noise Reduction

The Noise Element Background Report sets forth suggested methods for reducing noise in Huntington Beach. Suggestions are

broken down according to the categories listed below:

- traffic noise
- noise from aircraft operations
- noise from railroad operations
- noise from oil pumping operations
- dwelling unit modifications.

(1) Traffic Noise

The City has little authority to directly affect traffic noise sources. A number of steps can be taken to promote action at the State and Federal levels, however. Suggestions for action are listed below:

· The City should keep apprised of the State noise criteria levels and lend support or criticism, as appropriate, to noise-related measures initiated by the State Environmental Quality Study Council.

· The City should keep informed of actions by the Environmental Protection Agency concerning vehicle noise emission regulations and lend support or criticism as appropriate.

Although physical source modifications are generally beyond the control of local jurisdictions, local reduction of traffic noise through operational modifications is possible. Some suggestions follow:

· Revise flow control methods on surface streets to maximize steady flow conditions.

· Reroute traffic either by type (i.e., restrict usage by heavy trucks or impose curfews for noisier vehicle types) or by physical relocation (i.e., place noisier vehicles on innermost traffic lanes to increase path distance to observer and effective barrier shielding by other vehicles).

· Alter highway designs to achieve improved noise reduction and incorporate these features in new highways.

· Restrict residential usage of buffer zone on either side of highways.

· Reduce allowable vehicle speeds on major highways and freeways.

· Designate quiet zones by banning noisy vehicles from certain streets, highways, or freeways.

(2) Noise from Aircraft Operations

For the short-term, suggestions for reduction of noise from aircraft operations are:

- To prohibit any new development under the CNEL 65 contour.
- To require adequate noise insulation for new construction under the CNEL 60 contour.

For the long-term, suggestions for reduction of noise include:

- Acquisition of land
- Land use rezoning, and/or
- Noise insulation requirements.

(3) Noise from Railroad Operations

Suggested measures for reducing noise from railroad operations fall into two categories:

(a) Operating Procedures Recommendations

- Use of lower speeds, especially when passing through noise-sensitive areas
- Possible nighttime curfews or rescheduling (imposition of curfews must consider the secondary impacts of ground traffic congestion during daytime hours)
- Use of long radius curves.

(b) Land Use Considerations

- Use of below grade level rights-of-way
- Use of concrete bridgework structures
- Houses near tracks require many of the same modifications as houses near other high noise transportation sources with additional consideration to ground-borne vibrations
- Use of barriers in noise-sensitive areas.

(4) Noise from Oil Pumping Operations

Suggestions for reducing annoyance due to noise from oil pumping operations are as follows:

- prohibit new residential development within 150 feet of a gasoline engine-powered pump

- prohibit new residential development within 50 feet of an electric motor-driven pump.

(5) Dwelling Unit Modifications

Existing dwellings can be modified to varying degrees to improve sound insulation. Suggested modifications are:

(a) Minor Dwelling Modifications

Through attention to the following details, outside to inside noise reduction of A-weighted noise levels on the order of 20 to 22 dB is obtainable:

- Minimize "sound leaks" around doors, windows, and vents.

- Replace "acoustically weak" components.

(b) Moderate Dwelling Modifications

Moderate dwelling modifications would include those listed under "minor" plus additional attention to windows. Such treatments will produce overall sound insulation on the order of 30 dB for A-weighted noise levels.

(c) Major Dwelling Modifications

Major modifications consist of all items under "minor" and "moderate," plus some structural improvements of weak walls and roofs. Improvements in sound insulation available from these changes may yield noise reductions on the order of 40 dB for A-weighted noise levels.

Draft Noise Ordinance

The Noise Element Background Report provides a draft noise ordinance as a possible method of implementation. The draft ordinance will not be included in the final plan for adoption, but is being presented here as a possible tool for noise control and enforcement.

NOISE ELEMENT BACKGROUND REPORT

ERRATA

Crossout indicates deletion; underline indicates addition.

1. Page 1, Section 1.0, Line 5:
   ~~continum~~ continuum

2. Page 13, Section on Construction Noise, Line 7:
   ~~constroction~~ construction

3. Page 15, 8th Line from Bottom:
   Determine the feasibility of requiring noise level labeling for appropriate consumer products sold within the City, and prohibiting the sale of ~~prohibiting-the-sale-of~~ products exceeding approved noise standards.

4. Page 15, 5th Line from Bottom:
   The City should review its own functions and activities to make sure that noise from construction, refuse collection ~~(public-and-private-collection),~~ and street cleaning is reduced to the lowest possible level.

5. Page 19, 2nd Line from Bottom:
   ~~Southern-California~~ Orange County

6. Page 16, Paragraph 2, Line 4:
   ~~EIS~~ EIR

7. Page 94, Section 3.9, Line 2:
   ~~confustion~~ confusion

8. Page 105, Line 3:
   ~~conjunction~~

9. Page 142, Last Line:
   ~~In-rural-areas-where-adequate-buffer-zones-can-be-provided,~~

10. Page 143, Line 1:
    ~~these-devices-will-not-be-needed.~~

11. Page 143, Line 8:
    (2) encourage the State Department of Transportation to conduct an active highway noise abatement program ~~with~~. (Scenic/esthetic considerations could create this type of effect.)

12. Page 144, Line 4:
    One of the City's most important natural resources, ~~which-is-slowly being-eroded,-is-the-intrusion-into-the-natural-quiet-areas-of the-City~~ the natural quiet areas, are slowly being eroded by the intrusion of noise.

13. Page 151, Line 5:
This alternative ~~was-not-adopted~~ is not being recommended because of the extreme disruptive effects that could result to the area's economy, mobility and overall environment if such a program were initiated.

14. Page 151, Paragraph 4, Line 2:
~~established~~ establishes

15. Page 152, Section 5.9, Line 10:
~~Displacements-of-residents-in-high-noise-areas-adjacent-to certain-transportation-facilities-in-order-to-provide-adequate buffer-zones-would-result-in~~ Disruption of the social processes of these ~~communities~~ community resulting from displacement of residents in high noise areas to provide adequate buffer zones.

16. Page B-2, Item 2, Line 2:
The following parameters should guide selection of proper noise curves from Table B-1.

17. Page B-12, Column 4:
Distance to Desired Contour from Figure ~~B-7~~ B-7, Curve A

18. Page B-13, Section on Procedure, Line 1:
~~below~~ on the following page

19. Page C-4, Line 4:
~~Table-1~~ Table C-1

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1.0 INTRODUCTION

Unwanted sound or noise is part of the environment in which we live – a consequence of our activities. Although people have become adjusted to some noises and a certain degree of adaptation has occurred, there are obvious tolerance limitations that arouse serious concern from the standpoint of health, safety and welfare in today's society. The effects of noise on health represent a continum ranging from health hazards to less severe nuisances. The level of noise will continue to increase in proportion to the growth of the number of sources, and so will the number of individuals affected, unless the necessary steps are taken to curb this escalation. This increase is closely tied to the growth of urbanization, industrialization, and the standard of living index.

The most significant near-term solutions depend almost exclusively on the optimization of land use planning and regulatory techniques; the formulation of responsive public information programs; and, generally, the application of institutional, operational, physical, and legal techniques.

It must be recognized, however, that it is very difficult to obtain precise estimates of noise impact or the benefits derived from noise abatement because noise annoyance and nuisance, still the primary concern, are psychological states that to date have defied good quantification by social scientists.

1.1 Intent and Purpose

In the interests of public health, safety, and welfare, the objective of the Noise Element is to reduce the adverse effects of environmental noise within the City of Huntington Beach. The Plan provides a reference to be used in connection with actions on various public and private development matters, as required by law. The Plan includes definitions, objectives, policies, standards, criteria, programs and maps which are to be used when decisions are made affecting the noise environment within the city.

and miscellaneous randomly occurring noises which composed the background noise environment. Noise levels observed in the field study were then compared with human response annoyance criteria.

- <u>Presentation of Transportation Noise Contours</u>

Noise level contours were presented using the measurement scale system known as Day-Night Average Sound Level (L_{dn}). This scale is consistent with the State requirements.

Designation of the positions of the L_{dn} 60 and 65 dB noise contours for freeway and arterial systems was shown graphically on a city map employing a 1 inch = 800 feet scale for both the present and 1990 time periods. The L_{dn} 70 dB noise contour was also included along the heavily traveled San Diego Freeway, Beach Boulevard, and Pacific Coast Highway. CNEL 60, 65, and 70 dB contours were also graphically presented for Meadow Lark Airport. Calculations were made to locate L_{dn} contours of interest for the railroad line system in Huntington Beach. Railroad line noise contours were found to be nearly adjacent to the railroad tracks and were therefore not graphically presented, i.e., the L_{dn} 60, 65, and 70 dB contours were within the width of the ink pen on the 1 inch = 800 feet scale map. The State of California Department of Housing and Community Development has recently enacted a requirement that structures to be built within CNEL 60 dB contours (nearly equivalent to the L_{dn} 60 dB contour) require acoustical analysis to insure compatible levels inside the structure.

- <u>Land Use Compatibility</u>

Incompatible land uses (primarily residential) were identified within the areas of the critical noise contours based on the city's present and projected land use maps.

- <u>Mitigating Measures</u>

Noise abatement measures were identified as applicable to each of the major noise sources. These measures are linked to existing federal, state, and local regulations and sound criteria levels.

- <u>Draft Noise Ordinance</u>

A Draft Noise Ordinance was presented based on a model developed by the National Environmental Health Association.

- <u>Planning Department Noise Analysis Procedures</u>

A series of procedures were developed and are included herein, which will provide Huntington Beach Planning Department personnel with simple methods for computing and applying basic noise criteria for the generation of future noise contours and analysis for planning purposes. These techniques include procedures for computing highway noise data, railroad operations, and stationary source analysis.

1.3 C.I.R. Guidelines

The Noise Element has been prepared in compliance with California Government Code Section 65302(g), (Senate Bill 691) which requires that the following be assessed:

> (g) A noise element in quantitative, numerical terms, showing contours of present and projected noise levels associated with all existing and proposed major transportation elements. These include but are not limited to the following:
>
> (1) Highways and freeways,
> (2) Ground rapid transit systems,
> (3) Ground facilities associated with all airports operating under a permit from the State Department of Aeronautics.
>
> These noise contours may be expressed in any standard acoustical scale which includes both the magnitude of noise and frequency of its occurrence. The recommended scale is sound level A, as measured with A-weighting network of a standard sound level meter, with corrections added for the time duration per event and the total number of events per 24-hour period.
>
> Noise contours shall be shown in minimum increments of five decibels, and shall be continued down to 65 dB(A). For regions involving hospitals, rest homes, long-term medical or mental care, or outdoor recreational areas, the contours shall be continued down to 45 dB(A).*

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*The State recognizes that this level imposes large measurement errors and may not be practical in defining a level which is characterized as a residual level in most urbanized areas.

> Conclusions regarding appropriate site or route selection alternatives or noise impact upon compatible land uses shall be included in the general plan.
>
> The state, local, or private agency responsible for the construction or maintenance of such transportation facilities shall provide to the local agency producing the general plan a statement of the present and projected noise levels of the facility, and any information which was used in the development of such levels.

The guidelines further recommend that the scope and nature of the Noise Element include the following:

- A statement of general policy indicating the local jurisdiction's general intentions regarding noise and noise sources in the community.
- Desired maximum noise levels by land use categories.
- Standards and criteria for noise emissions from transportation facilities. (It should be noted that control of some noise sources has been preempted by state and federal governments.)
- Standards and criteria for compatible noise levels for local "fixed-point" noise sources.
- Guide to implementation.
- Appendix describing methodology of preparation and sources of data.

1.4 Environmental Quality Act

An environmental report which analyzes potential effects of public and private projects is required by the California Environmental Quality Act (CEQA) for all General Plan elements. This legislation compels discussion of seven pertinent subjects:

1. Environmental impact of proposed action
2. Adverse but unavoidable environmental effects
3. Mitigating measures to minimize impact

4. Alternatives

5. Short-term and long-term impacts

6. Irreversible environmental changes

7. Growth inducing impact

1.5 Relation to the Planning Program

The City of Huntington Beach is currently executing a program to revise its existing Master Plans to meet the changing requirements of state law and the growing needs of an expanding community.

Figure 1-1 illustrates where the Noise Element fits into the Advance Planning Program. As indicated, not only will old Master Plans be combined into the new General Plan elements, but the future planning program will also consolidate the six compulsory environmental elements in an Environmental Resources Management Program (ERMP). The ERMP – which combines open space, conservation, scenic highways, seismic safety, safety, and noise considerations – will provide a guiding influence for all future growth and development.

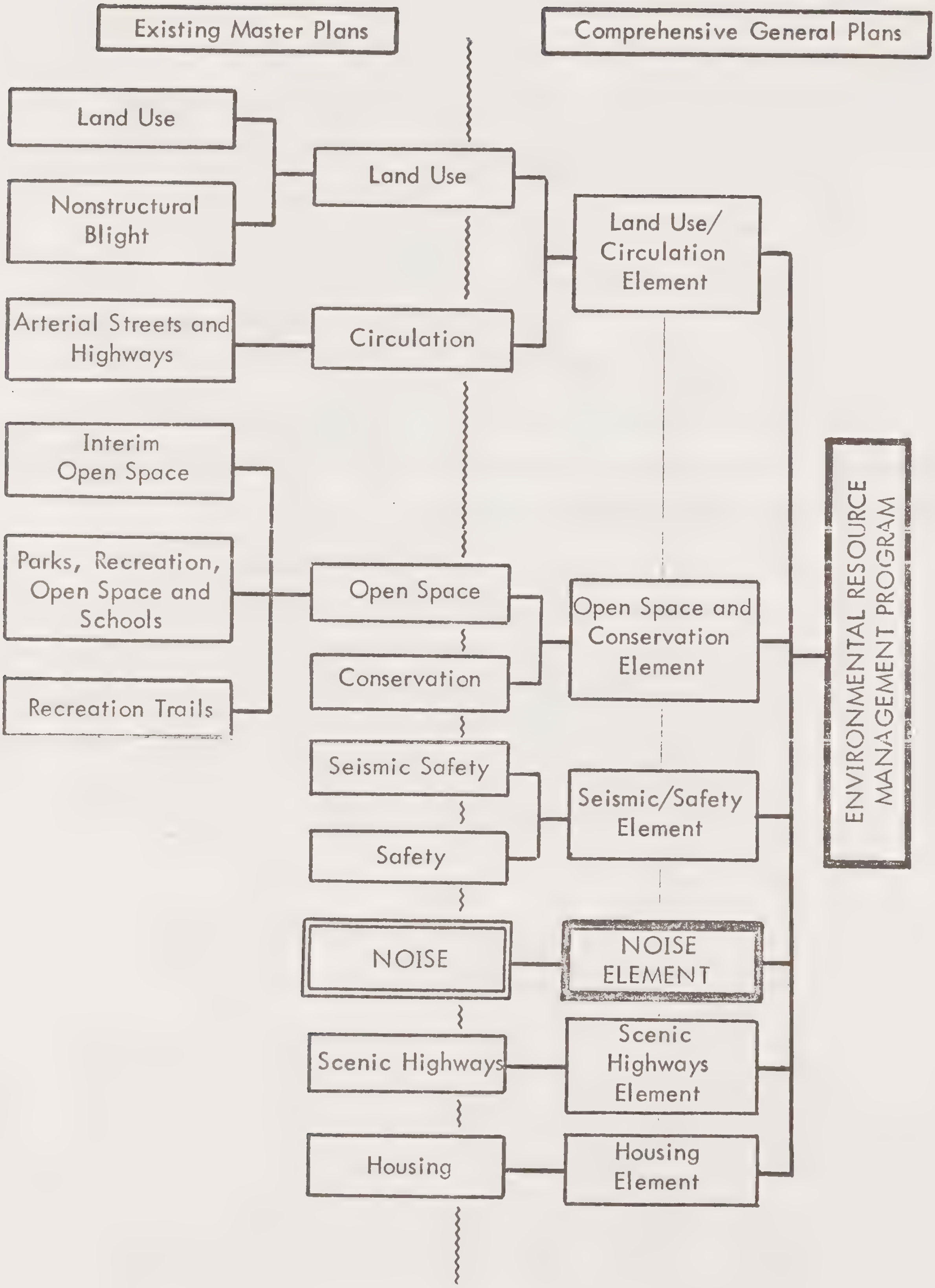


Figure 1-1. Relationships Between Master Plan and Comprehensive General Plan Elements

2.0 GOALS AND POLICIES

The development of goals and policies is the most fundamental aspect of the planning process. A goal is the expression of an ultimate ideal to be achieved. It is the end result toward which efforts are directed. While a goal represents where to go, a policy is a directive on how to get there. It implies a realistic method and a general guide by which goals can be obtained. Because goals and policies describe in general terms both the community's future and the most desirable route for arriving at it, these statements of community purpose and intent direct the selection of the most desirable future for the city from the many alternatives available. The level of noise reduction desired by city residents, as reflected in the policy plan, is translated in the following pages into a summary statement of goals, policies and programs to serve as the basic principles for the noise element.

2.1 Goals and Policies Statement

The following statements represent a comprehensive directive on the reduction of environmental noise to insure maximum acceptable public health, safety and welfare.

2.1.1 Goal

To reduce to acceptable levels the degree of noise exposure from all transportation, stationary and other nuisance sources in the community to insure the public health, safety and welfare.

2.1.2 Objectives of the Plan

- To coordinate intergovernmental efforts to abate noise.
- To reduce the impact of noise from all types of aircraft.
- To reduce motor vehicle noise from streets and freeways through proper location and design.
- To reduce noise levels produced by all types of motor vehicles.

- To require acceptable noise levels for future modes of transportation.
- To reduce the impact of railroad noise.
- To reduce the impact of construction and industrial noise.
- To minimize external noises and prevent them from penetrating quieter uses.
- To abate unnecessary outdoor noises.
- To provide the basis for noise evaluation in land use considerations, and Environmental Impact Reports.
- To acquaint people with the seriousness of noise pollution, and ways they can assist in reducing noise.

2.1.3 Policies

General

- The city shall develop noise reduction strategies and priorities to reduce noise in the highest noise-impacted areas.
- The use of quieter automobiles, machinery and equipment shall be encouraged.
- A sound certification program of published sound ratings for various types of equipment that are sources of noise shall be encouraged.
- Conduct noise surveys of the city to aid in determining land use policies.
- Criteria for location and design of certain "noise sensitive" land uses and facilities (schools, hospitals) shall be developed.
- Consideration of the noise environment shall be a part of land use planning.
- Unnecessary outdoor noises shall be regulated or abated.

Governmental Coordination

- A mechanism to assure coordination of all governmental jurisdictions in the field of noise control, abatement and research shall be developed by the city.
- The use of loans, grants, demonstration projects and other incentives to achieve noise abatement shall be encouraged.
- Equipment noise standards and labeling by the Federal Government shall be encouraged.

Aircraft Noise

- Airport noise abatement policies shall be enforced.
- The Federal Aviation Administration should be encouraged to assign cruise altitudes high enough to minimize the impact of aircraft on land use.
- Ground operations shall be conducted in a manner to minimize the impact of aircraft noise on adjoining areas.
- Land uses within airport noise impacted areas as defined by existing or future applicable state or federal airport noise standards shall be made compatible with airport operations. Future development within these impacted areas shall be restricted to compatible uses.
- The city shall continue to encourage the use of noise suppression devices and other noise reducing modification to planes using the airport located in the city.
- Effective noise barriers shall be developed in all airports run-up areas when an external noise problem exists.
- Flight operations shall be conducted in a manner to minimize noise within the constraints imposed by federal regulations on aircraft operations.

Helicopter Aircraft Noise

- Helistops and heliports shall be located and designed to minimize the impact of noise.
- Helicopter operations shall be conducted in a manner to minimize noise.
- Noise criteria for future helistops shall be established. Conditional use approval of helistops shall include noise mitigating conditions.
- The use of quieter helicopters shall be encouraged.

Street and Freeway Noise

- In designing new freeways within the city, preference shall be given to depressed freeways as a method of reducing noise impact on adjacent lands.
- Where appropriate, noise mitigation measures shall be employed in the design of all future streets, highways and freeways; and freeways shall be insulated from adjoining areas wherever possible.

Motor Vehicle Noise

- Continue to encourage the reduction of noise impact from automobiles, motorcycles, buses and trucks by lowering the level of sound produced at the source.
- Continue to require adequate noise suppression devices for all motor vehicles operated within the city.
- Continue strict enforcement of the noise standards in the Motor Vehicle Code and other state and federal legislation pertaining to noise offenders.

Other Modes of Transportation

- Development of transit systems with low noise emission characteristics shall be encouraged.

- More efficient, comfortable and quieter bus service shall be promoted.
- Railroad noises shall be minimized to the extent possible.

Construction Noise

- Quieter machines and vehicles shall be purchased by the city, and quieter equipment shall be required in work performed on city contracts.
- Standards to regulate noise from construction activities shall be developed and enforced.
- Installation of silencers or mufflers on construction equipment intake and exhaust openings shall be required.
- Enforce the limitations on hours for constrection activity in the city's noise ordinance.

Industrial Noise

- Noise from industrial activities shall be regulated through noise ordinances and zoning.
- Industrial Performance Standards, including noise standards, shall be developed and applied in order to provide more flexible controls on industrial noise.

Noise/Land Use

- Acoustical privacy shall continue to be required in new multi-family dwellings.
- Noise from motors (e.g., air conditioners, swimming pool equipment, etc.), appliances and other consumer products shall not disturb the occupants of surrounding properties.
- New structures to be located in noise-impacted areas such as hotels and motels, shall be required to include noise attenuation considerations in their design and construction.

- In areas subject to unusual, loud, or continuous noise, population densities and building intensities shall be regulated so as to protect occupants from noise.
- Noise control methods shall be considered in the construction of new schools and hospitals.

Noise Surveillance and Enforcement

- Noise standards in the state's Motor Vehicle Code, and other state and federal legislation pertaining to noise sources not regulated directly by city ordinance, shall be strictly enforced. The potential offenders include aircraft, trucks, trains, buses, automobiles, motorcycles and pleasure vehicles.

Research and Legislation

- Methods for measuring and rating noises in residential, industrial and traffic-impacted areas shall continue to be developed.
- Community noise surveys shall be conducted as part of each community plan study.
- Recommend needed federal and state legislation in the areas of revised motor vehicle noise standards, freeway and highway noise design criteria, noise mitigation and land use sensitivity.

2.1.4 Programs

General

- Conduct studies of alternative methods of acquisition of noise impacted areas, including utilization for open space buffers.
- Encourage the use of loans, grants, demonstration projects and other incentives to achieve noise abatement.
- Conduct community noise surveys as part of community plan studies.

- Develop design criteria for active recreational facilities so as not to transmit noise to surrounding residential areas.
- Apply the residential acoustical design criteria in the Building Code for the construction of new hospitals and convelescent homes.
- Consider an ordinance to require insulation and other noise control methods on new schools and hospitals within L_{dn} 60 noise contours.
- Study noise criteria for use in planning the location of new school facilities.
- Review public improvements in noise-impacted areas, to insure that noise abatement measures are included in the project.
- Consider noise impacts in land development actions (zone changes, subdivisions, conditional uses, etc.) with special attention given to noise sensitive uses.
- Seek federal and state financial assistance for future noise studies including alternative transportation systems, community plan surveys and monitoring.
- Consider an ordinance to require activities which find it economical to locate in noise impacted areas, such as hotels and motels, to include noise attenuation considerations in their design and construction.
- Determine the feasibility of requiring noise level labeling for appropriate consumer products sold within the city, and prohibiting the sale of prohibiting the sale of products exceeding approved noise standards.
- The city should review its own functions and activities to make sure that noise from construction, refuse collection (public and private collection), and street cleaning is reduced to the lowest possible level.
- Consider the use of noise criteria in the purchase of new equipment by city departments and agencies as part of bid evaluation.

Governmental Coordination

- Clarify the roles of the federal, state, county and city governments in noise abatement.
- Federal, state and local governments should consider the social and economic impacts of noise in all regional and urban planning efforts.
- Develop a mechanism to assure the coordination of all jurisdictions in the field of noise control, abatement and research.
- Develop regional planning agreements to reduce noise imcompatibilities across city boundaries using such tools as zoning and performance standards.
- Continue to review county and regional plans for transportation, airports, etc. to identify the environmental impact of noise and to develop alternatives for the control of major noise sources.
- Request the federal and state governments, in cooperation with standardization organizations and industrial associations to develop standards for noise level labeling of consumer products that are sources of noise.

Aircraft Noise

- Investigate all legal methods for enforcing noise standards for airports not under city jurisdiction, but whose operations adversely affect the city.
- Encourage appropriate jurisdictions to undertake noise monitoring for all airports where the CNEL 65 noise contours fall within the city, and map these contours on an annual basis for use in planning and building evaluation.
- Request the FAA to require operators of pleasure aircraft to fly at altitudes sufficient to minimize noise on the ground.
- Conduct studies to insure that there are effective noise barriers in all airport runup areas.

- In areas adversely affected by aircraft noise, conduct feasibility studies to encourage commercial and manufacturing uses which are compatible with higher noise levels than residential uses and/or establish "buffer zones".
- Encourage research on acoustical insulation of structures in areas affected by airport noise. If acoustically successful and economically feasible methods can be achieved, continue to insulate residential structures as a temporary relief measure.
- Develop a method to provide federal financial assistance for persons adversely affected by excessive noise from the airport developed with federal assistance. (This would include soundproofing of schools and homes and development of replacement housing.)
- Consider the development of an Airport Zoning Ordinance which is tied to soundproofing modifications in the Building Code.
- Consider an ordinance to prohibit incompatible land uses to be constructed within airport noise contours exceeding CNEL 65, and substantially reduce incompatible land uses within these noise contours.

Helicopter Noise

- Develop noise standards to control helicopter landing facilities in and near residential areas.
- Develop noise standards to regulate ground level helicopter landing facilities in highly developed areas; it is preferable to locate helistops on rooftops of buildings which are higher than surrounding buildings.
- Noise criteria should require noise mitigating designs for helistops and heliports, by using distance, terrain, barriers, baffles, etc.

- Develop standards to require non-emergency helicopters to fly at adequate heights to avoid adversely impacting residential and other noise sensitive areas, and limit the hours of operation and flight routes.
- Consider noise criteria in purchasing Police and Fire Department helicopters as part of bid evaluation.

Street and Freeway Noise

- Continue to work closely with the State Department of Transportation in the early stages of freeway routing and design to insure proper consideration of noise impact on the city.
- Establish guidelines for acceptable freeway and highway noise levels, incorporating source noise reduction, barriers, and other design elements.
- In future highway studies, design highways with as few stops as possible.
- Request federal and state highway assistance to develop noise mitigation measures for use on freeways and highways.
- Encourage larger setbacks or service roads to reduce adverse noise effects along major and secondary highways and other large traffic volume streets.
- In the design and construction of freeways and local streets and highways, provide artificial barriers for noise insulation, to the extent feasible.
- Consider an ordinance to prohibit incompatible land uses to be constructed within freeway noise contours exceeding L_{dn} 65, and to substantially reduce incompatible land uses within these freeway noise contours.

Motor Vehicle Noise

- Adopt noise criteria for use in the purchase of all city-owned motorized vehicles.
- Encourage the federal government to improve noise characteristics in vehicle design.

- Recommend that noise criteria be used by other public agencies and private firms with large numbers of vehicle operating in the city.
- Recommend that the State of California adopt more rigorous noise standards governing the operation of all trucks and buses, including annual noise certification.
- Encourage the federal government to conduct additional noise reduction studies on diesel trucks. These studies should go beyond studies of muffler improvements and tire tread design.
- Conduct studies to develop alternate truck routes through industrial areas to minimize noise in residential areas of the city.
- Continue enforcement procedures to effect compliance with noise standards.
- Formulate quantitative noise standards for automobiles and motorcycles which are more strict than the current standards of the State of California and recommend them to the State for inclusion in the Motor Vehicle Code.

Other Modes of Transportation

- Ensure that any steel track rapid transit system serving the city in the future considers the use of welded rails in preference to section rails, in order to reduce track vibration noise.
- Continue studies of each mass rapid transit corridor, including an analysis of methods of noise attenuation.
- Encourage the development of quiet transit vehicles, and prohibit unnecessary noise within vehicles.
- Seek federal and state financial assistance to provide noise attenuation in a mass rapid transit system.
- Encourage the Southern California Rapid Transit District to consider noise criteria as an important factor in their purchase of new buses.

- On a priority basis, develop a program to encourage railroads to provide noise attenuating buffers along railroad rights-of-way in residential areas.

Construction Noise

- Encourage the use of quieter equipment on city construction projects through the use of noise criteria as part of the bidding procedure.
- Use the city's noise ordinance to require the installation of airflow silencers or mufflers on construction equipment intake and exhaust openings.
- Regulate construction or excavation noise between the hours of 8:00 P.M. and 7:00 A.M. of the following day.

Industrial Noise

- Consider the use of the city's noise ordinance to require that noisy industrial equipment be fully or partially insulated by sound-attenuating material to reduce noise levels emitted to nearby areas.
- Consider the restriction of new residential land use within the proximity of oil well pumps.
- Encourage the use of electrical or submersible oil well pumps for all new installations and/or replacement of older pumps.
- Encourage industry to conduct research on the technology of noise abatement and control as it relates to their activities.
- Encourage the federal and state governments to continue to provide standards of allowable industrial noise exposure so that all workers are adequately protected against noise-induced hearing loss. (Many occupations may require the use of ear protection devices.)

- Consider the adoption of Industrial Performance Standards, including noise standards, similar to those in the proposed Revised Zoning Code, Industrial Zones.
- Continue to encourage the use of sound barriers around existing oil well pumps in proximity to residences when the pump exceeds recommended noise levels.

Noise/Land Use

- In noise-impacted areas, require all new noise-sensitive land uses to be acoustically engineered for indoor noise standards.
- Use design criteria in site planning as a technique to minimize intrusion of exterior noise into buildings.
- Continue to consider noise control early in the design stage of multi-family dwellings to reduce the cost of acoustical treatment.
- Conduct studies to reduce noise sensitive land uses in community plans.
- Enforce the City's Noise Ordinance to abate disturbing noise emanating from air conditioners, lawn mowers, and other consumer products.

Noise Surveillance and Enforcement

- Inform the public about the city's noise ordinance and enforce the ordinance to abate unnecessary outdoor noises.
- Consider a noise monitoring program and evaluation system which would include, but not be limited to:
  1. Continue reviewing the city's noise ordinance in light of enforcement experience, and making appropriate amendments, and modifying city codes to make them consistent with the noise ordinance.
  2. Developing and maintaining a systematic survey of the city. This will help to provide a way to determine the effectiveness of noise control measures.

3. Seeking federal and state funding for the development of local noise surveillance and monitoring.

- Encourage governmental agencies to enact uniform noise codes, regulations and standards.

Research and Legislation

- The city should conduct studies into the development of sound exposure zones which will control the types of activities that may locate there.
- Continue noise control research and its application in residential housing, particularly in multi-family dwellings.
- Request the federal government to expand their research into noise in the following areas:
  1. Community response to noise.
  2. The costs and benefits of noise, noise control standards and noise mitigation.
  3. The application of noise control technology to vehicles, transportation systems, machinery, appliances and construction.
- Develop criteria for the location of land uses and facilities which are incompatible with noise, such as schools, hospitals, and single-family housing.
- As part of the community planning process, study ambient noise levels and identify major stationary noise sources.
- Encourage the federal and state governments to provide other incentives for manufacturers who voluntarily improve existing equipment for the purpose of lowering noise levels.

3.0 COMMUNITY NOISE

It is the function of the Noise Element to mitigate the impact of noise on the community. The sources of noise which impact on the community include transportation noise, industrial noise, construction noise, heating, ventilation and air conditioning noise, human activity noise, and noises from animals. Each of these factors can have varying degrees of influence on the noise environment.

This section presents a general discussion of the noise impact on people; a description of the noise environment in the City of Huntington Beach; recommended criteria levels for the many noise sources cited; and mitigating measures for alleviating the impact.

3.1 Human Response to Noise

No community is exempt from the problems associated with noise, and the magnitude of the problem is generally directly correlated with the density of population. However, population density effects are compounded by the influence of standard of living, i.e., the higher the standard, the greater the propensity for the acquisition of noise producing material goods and services — also, the greater the sensitivity to noise.

Why some people complain while others almost never do, given similar noise intensities, can only be explained in terms of variable behavior patterns, social conditioning processes as a function of past experience to noise, social, educational and occupational achievement and an awareness of local political and legal reciprocity. Additional factors that prompt people to react to noise in various ways are listed in Table 3-1. Typical values for a variety of community noise sounds are given in Table 3-2.

The public's response to specific noise sources does not vary greatly between urbanized centers of the world. Road traffic is still the major contributor to noise annoyance as exemplified in Tables 3-3 and 3-4. The effects of noise exposure may be divided into two categories, as identified in Table 3-5. The ramifications of these effects are potentially far reaching, and have aroused significant controversy. Conclusive evidence

Table 3-1

Sociopsychological Aspects of Community Sound Nuisance*

- The 31 – 60 age group generally experience a somewhat greater measure of sound nuisance than other groups.
- Men and women generally experience sound nuisance to the same extent.
- Sound nuisance tends to decrease with increase of family size.
- Sound nuisance tends to increase as the children grow older.
- With rise in grade of occupation, an increasing measure of sound nuisance is experienced; white collar workers usually experience more sound nuisance than manual workers.
- In the case of persons following a certain branch of education, most sound nuisance is experienced by those of the highest educational group.
- As in the case of education and occupation, sound nuisance is experienced to a greater extent with increase of income.
- The most prosperous classes are more susceptible to sound nuisance than the least prosperous classes.
- Higher social standing is usually associated with higher susceptibility to sound nuisance.
- In households where children engage in study in the evenings more sound nuisance is experienced than in families where this is not the case.
- In households where the head of the family pursues home activities with a view to self-education or to studying for a profession, more sound nuisance is experienced than in households where the head of the family does not engage in such home occupations.

*Reference 1.

Table 3-2

Comparison of Typical A-Weighted Sound Levels*

Noise Level dBA	Noise Source
120	Small rocket engine at 100 feet
115	Rock bands at 25 feet, jet aircraft at 100 feet
110	Police sirens
100	Jet aircraft at 1000 feet
95	Trains at 100 feet
90	Trucks, industrial machines, light aircraft
85	Automobile at 50 feet and 60 miles per hour
75	Children in school yards at 50 feet
70	Inside of automobile at 70 miles per hour
65	Typewriters
60	Normal conversation
55	Residential community during day
45	Residential community at night
40	Enclosed office
20	Sound recording studio

*Reference 2.

Table 3-3

Annoyance from Noise in London*

Description of Noise	Number of People Annoyed per 100 Questioned		
	At Home	Outdoors	At Work
Road Traffic	36	20	7
Aircraft	9	4	1
Trains	5	1	-
Construction Work	7	3	10
Light Appliances	4	-	4
Neighbors	6	-	-
Children	9	3	2
Adult Voices	10	2	2
Radio/TV	7	1	1
Bells/Alarms	3	1	1
Pets	3	-	-

*Reference 3.

Table 3-4

Annoyance from Noise in Japan**

Type of Noise	Number of People Annoyed per 100 Questioned
Passenger Cars	9
Large Trucks and Buses	48
Automobile Horns	14
Motorcycles and Small Cars	57
Not Disturbed by Traffic Noise	14
No Opinion	4

**Reference 4.

Table 3-5

Primary Effects of Noise Ranked in Approximate Descending Order of Importance*

Rank	Direct Effects
1	Sleep Disturbance (Awakening, etc.)
2	Speech Interference
3	Hearing Loss
4	Noisiness
5	Task Interference
6	Masking of Speech or Communicating Sounds

Rank	Indirect Effects
1	Annoyance
2	Social Behavior
3	Health and Well Being
4	Sleep Disturbance (Cumulative Fatigue Effects)
5	Other Task Interference Fatigue Effects

*Reference 5 (Ranking by a Panel of Specialists in Noise)

of undesirable effects of noise on man is generally available only for hearing damage, speech interference and sleep disturbance. Noise annoyance or nuisance, still of primary concern, are psychological states that to date have defied good quantification by social scientists.

General community reaction to noise predicted by composite measurement scales such as the L_{dn} scale is shown in Figure 3-1. In this case, secondary influences on community response to noise are normalized to typical values as indicated in the figure. Table 3-6 identifies the various types of community noise sources.

3.2 Noise Source Identification

Introduction

The major sources of potentially intrusive noise within the City of Huntington Beach are discussed below.

Highway Systems

The types of roadway systems observed in this study included:

1. All freeways,
2. All primary arterials, and
3. Some of the major collector streets.

Basic data requirements used in the noise analysis for each of these roadway types are discussed in Section 3.5.1. The noise analysis procedure enables definition of land zones covering various levels of human compatibility for present traffic conditions. Given the future traffic data projections for any segment of road presently in use, the current noise analysis may be corrected to meet any future case by use of the simplified correction procedure given in Appendix B.

Railroad Operations

The Southern Pacific Railroad operations that take place in Huntington Beach were considered. Railroad line activity was limited, however, to branch line

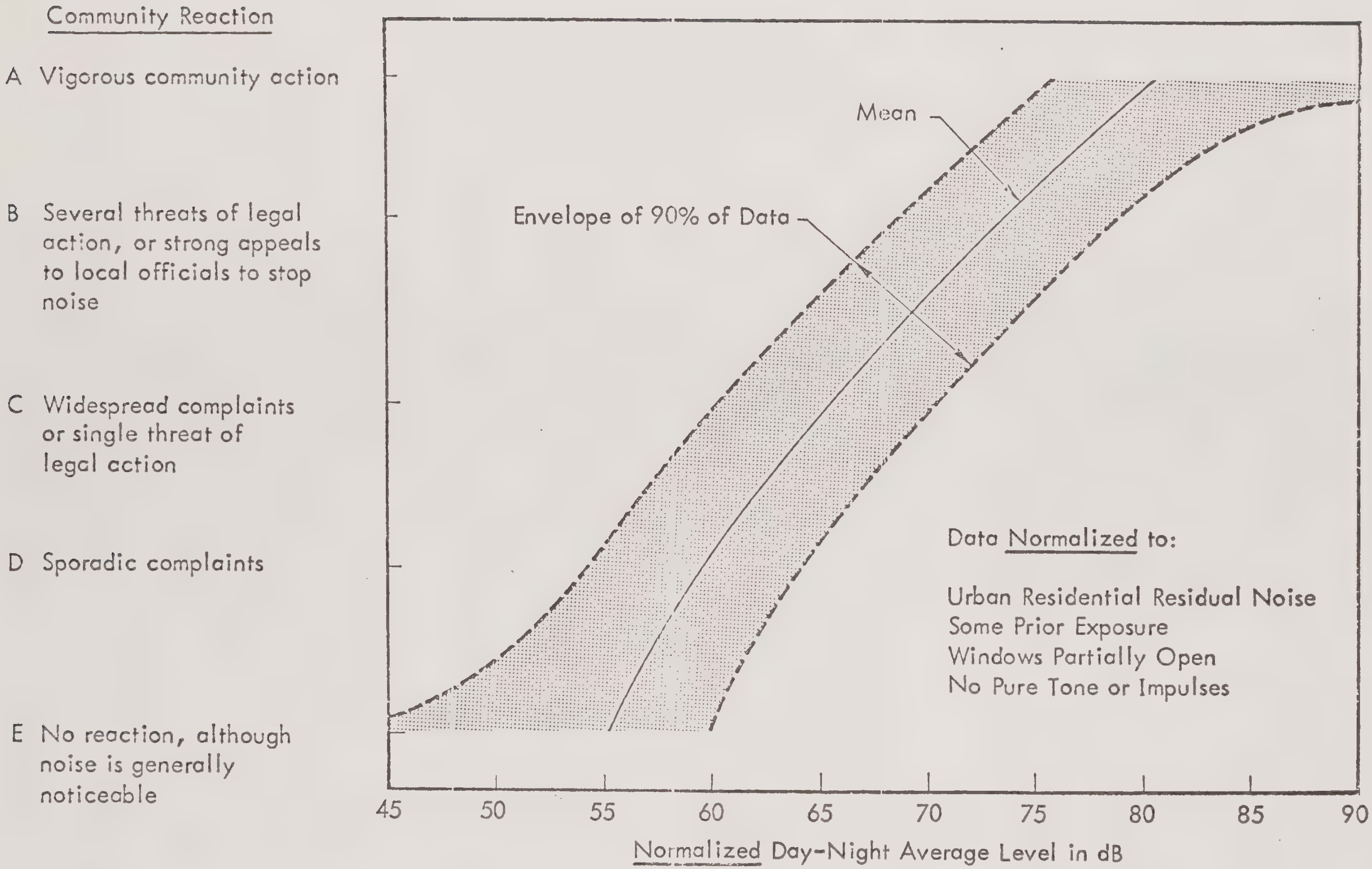


Figure 3-1. Community Reaction to Intrusive Noises of Many Types as a Function of the Normalized Day-Night Average Level (L_{dn}) (Based on Reference 6)

Sources of Noise

A. Transportation
   1. Rail
      a. Train track noise
      b. Breaking
      c. Squeak of wheels on curves
      d. Whistles
      e. Air brakes
   2. Trucks
      a. Exhaust noise
      b. Engines
      c. Transmission and differential noise
      d. Chain drive noise
      e. Chassis noise
      f. Brakes
      g. Air compressors
      h. Sheet metal parts
      i. Tire whine
   3. Automobiles
      a. High speed tire squeal
      b. Tire tread noise
      c. Rattles
      d. Engine noise
      e. Exhaust
      f. Horns
      g. "Cutouts"
   4. Aircraft
      a. Piston engines
      b. Jet aircraft noise
      c. Helicopter blade noise

B. Industrial Noise
   1. Out-of-doors processing
      a. Air intake
      b. Discharge ducts
      c. Compressors
      d. Engine intakes and exhausts
      e. Pump and engine radiation
      f. Steam discharge
   2. Enclosed Industrial Plant
      a. All of above
         (1) With open windows
      b. Fans and blowers
      c. Punch presses
      d. Machine tools
      e. Forging equipment
      f. Printing presses
   3. Out-of-doors operations
      a. Warehousing of steel and lumber
      b. Scrap yards
      c. Truck and rail freight handling
      d. Transportation and loading
         (1) Freight cars
         (2) Local yard movements
   4. Plant auto traffic
      a. Shift employees
         (1) Leaving and arriving at early or late hours

C. Construction Noise
   1. Diesel engines
      a. Generators
      b. Compressors
      c. Trucks
      d. Shovels
      e. Bulldozers
      f. Frontloaders
      g. Scrapers
      h. Power shovels
      i. Rock drills
   2. Electric Motors
      a. Whining and groaning sounds
   3. Air Compressors
      a. Intake and discharge
   4. Blasting
   5. Pile driving
      a. Engine
      b. Hammer driven caissons
   6. Riveting
      a. Hammer
      b. Electric or pneumatic nut-setter
   7. Materials handling equipment
      a. Demolition
      b. Scrap material handling
      c. Elevators
      d. Cement mixers
   8. Special equipment
      a. Generators
      b. Rock drills
   9. Interior finishing
      a. Residential construction
      b. Hammers
      c. Power saws
      d. Electric drills

D. Heating, Ventilating and Air-Conditioning
   1. Air Conditioning
      a. Cooling tower
         (1) Fans
         (2) Water Spray
      b. Window units
         (1) Compressor
         (2) Fan
         (3) Rattles
      c. Intakes and discharges
      d. Draft fans
      e. Oil burners
      f. Combustion
      g. Pumps
      h. Attic ventilating fans

E. Non-Environmental Interaction Noise
   1. Leisure activities
      a. Radios
      b. Stereos
      c. T.V.
      d. Musical instruments
      e. Workshop and home improvement tools
   2. Outdoor activities
      a. Power mowers
      b. Hedge trimmers
      c. Chain saws
      d. Auto repairs
         (1) Engine run-up
   3. Talking
      a. On street
      b. Arguments
      c. Parties
   4. Vehicles
      a. Ice cream trucks
      b. Delivery trucks
      c. Ambulances
      d. Fire vehicles
      e. Motorcycles
   5. Refuse collection
      a. Trash cans
      b. Engine exhaust
      c. Loaders and compactors
   6. Meeting noises
      a. Street meetings
      b. Religious meetings
      c. Concerts
      d. Church bells
   7. Children at play
      a. School yard
      b. Playground
      c. Street
      d. Yards
   8. Animals
      a. Barking dogs
   9. Sound Trucks

Table 3-6. Sources of Community Noise

movement of freight cars and yard operations of minor delivery and pickup of freight at local industries. An analysis of the railroad noise is presented in Section 3.6.2.

Aircraft Operations at Meadow Lark Airport

The general aviation-type operations of Meadow Lark Airport were identified as a potential noise annoyance to Huntington Beach. Section 3.6.3 elaborates on the operational data and aircraft mix required in the Meadow Lark Airport noise analysis. An evaluation of police helicopter operations was also conducted.

Miscellaneous Noise Sources

Aside from transportation noise sources, several types of miscellaneous intrusive noises, including oil well pumps, within Huntington Beach were characterized by making field observations throughout the City. General categories of community noise included: dogs barking, commercial public address systems, lawn mowers, household construction projects, children, oil well pumps, power substations, and police surveillance helicopters. Most miscellaneous noise sources with the exception of oil well pumps and police helicopters were not within the scope of this study, nor could they be analyzed in the same fashion as the transportation systems. These sources should be dealt with on an individual basis and corrected by enforcement of the Noise Ordinance.

3.3 Rationale for Selection of Suitable Community Noise Rating Scales

Introduction

The scale deemed most appropriate to satisfy the requirements for assessment of environmental noise sources as defined in California Government Code 65302(g) has been identified as the Day-Night Average Sound Level, L_{dn}. This scale has been selected in that it most completely satisfies the following criteria:

- Relates well with human reaction to community noise.
- Compatible with proposed EPA recommendations for the assessment of community noise environments.

- Compatible with the requirements expressed by the State of California.

- Measurable with simple sound level equipment.

Discussion of Measurement Scales

The suggested properties for a noise rating scale called for in California Government Code 65302(g) are summarized below:

- Based upon A-weighted measure of the noise.

- Correction for time duration of events.

- Correction for number of events during the 24-hour period.

Since a rating scale based upon the A-weighted measure of noise is specifically recommended by the State of California, only those scales which utilize this base have been considered. The specific scales which were evaluated are discussed as follows:

A-Weighted Sound Pressure Level, dB

Sound levels that are measured over all audible frequencies with a selective discrimination against low and high frequencies to simulate human hearing are termed A-weighted sound levels and are expressed in dB. They are commonly measured with a sound level meter (ANSI Standard S1.13-1971) that integrates and weights the broadband signal input electronically. The A-weighting network roughly approximates the frequency response of the human ear, and the associated levels can be time-averaged to yield average sound pressure levels which have been widely correlated with degrees of community impact and human annoyance. A-weighted sound levels are the basis for several more comprehensive measurement scales.

L_{10} Statistical A-Weighted Noise Level

The L_{10} level represents the A-weighted noise level which is exceeded 10 percent of the time over the duration of the sample noise measurement. This statistical descriptor has been utilized for assessment of noise impact of traffic noise, where it has been applied to the peak traffic flow periods. It represents a measure of the higher, but less frequent sound levels occurring during the measurement sample.

Equivalent Energy Level, L_{eq}

L_{eq} is an average noise level based on the average energy content of the sound rather than average sound pressure level. It is the constant sound level, in dB, which produces the same average energy as the actual time-varying sound during the averaging time period. Due to the logarithmic basis for the decibel, this "energy mean: level will differ from an arithmetic mean of sound pressure levels. L_{eq} is not measured directly, but is calculated from sound pressure levels measured in dB. This descriptor is the basis for both the L_{dn} and CNEL scales.

Single Event Noise Exposure Level, SENEL

SENEL is defined as the logarithmic integration of sound energy over the event duration normalized in seconds. SENEL calculations are particularly applicable in describing short duration events such as single passbys of automobiles, trucks, railroads, and aircraft.

Day-Night Average Sound Level, L_{dn}

The Day-Night Average Sound Level is a measure of the cumulative noise exposure in the community. It results from the energy summation of hourly L_{eq}'s over a 24-hour time period with an increased weighting factor applied to the nighttime time period. For L_{dn} calculations, day is defined as 7:00 a.m. to 10:00 p.m. with a weighting factor of unity. Night is defined as 10:00 p.m. to 7:00 a.m. and sound levels are increased by 10 dB to account for greater sensitivity at night.

Community Noise Equivalent Level, CNEL

The Community Noise Equivalent Level is essentially the same as L_{dn} with the exception that an evening time period between 7:00 p.m. and 10:00 p.m. is also considered in the analysis. Noise levels during this time period are weighted by a factor of +5 dB. Noise contours developed by CNEL and L_{dn} procedures will normally agree within 1 dB. The L_{dn} technique represents the evolution of CNEL and the method provides computational simplification of an established rating scale with no significant loss of accuracy.

Selection of Measurement Scale

The typical community or environmental noise condition is comprised of slow periodical variations of a residual level upon which are superimposed single event noise level peaks from individual noise sources as illustrated in Figure 3-2. Clearly, the quantities described above can be used effectively to describe this pattern at any time, accurately accounting for most of the significant variables. They are readily calculated from simple A-weighted sound pressure level measurements made during selected time periods. After due consideration of the State requirements, the Day-Night Average Sound Level, L_{dn}, was deemed most appropriate. The evaluation of the various scales with respect to the acceptability criteria is illustrated in Figure 3-3. This selection is further substantiated by the following conclusions presented in a recent report by the EPA on Impact Characterization of Noise Including Implications of Identifying and Achieving Levels of Cumulative Noise Exposure.[7]

> Conclusion 1. For the characterization of the cumulative impact of noise environments on human health and welfare, a single noise measure is required for use by the Federal Government. This measure must be the same for all types of noises so that the contributions of various types of noise source to the total environment exposure can be identified.
>
> Conclusion 2. Evaluation of existing and proposed methods available for the description of environmental noise leads to recommendation of the Day-Night Average Sound Level as the method of choice.

Compatibility of L_{dn} Scale with Other Noise Rating Scales

As has been previously stated, the Day-Night Average Sound Level, L_{dn}, represents a local simplification of the CNEL scale with no significant loss in accuracy. It has been generally observed that the L_{dn} simplification yields results within 1 dB of the more rigorous CNEL method for all categories of environmental noise sources. (It should be noted that variation ±1 dB represents normal noise level measurement accuracy

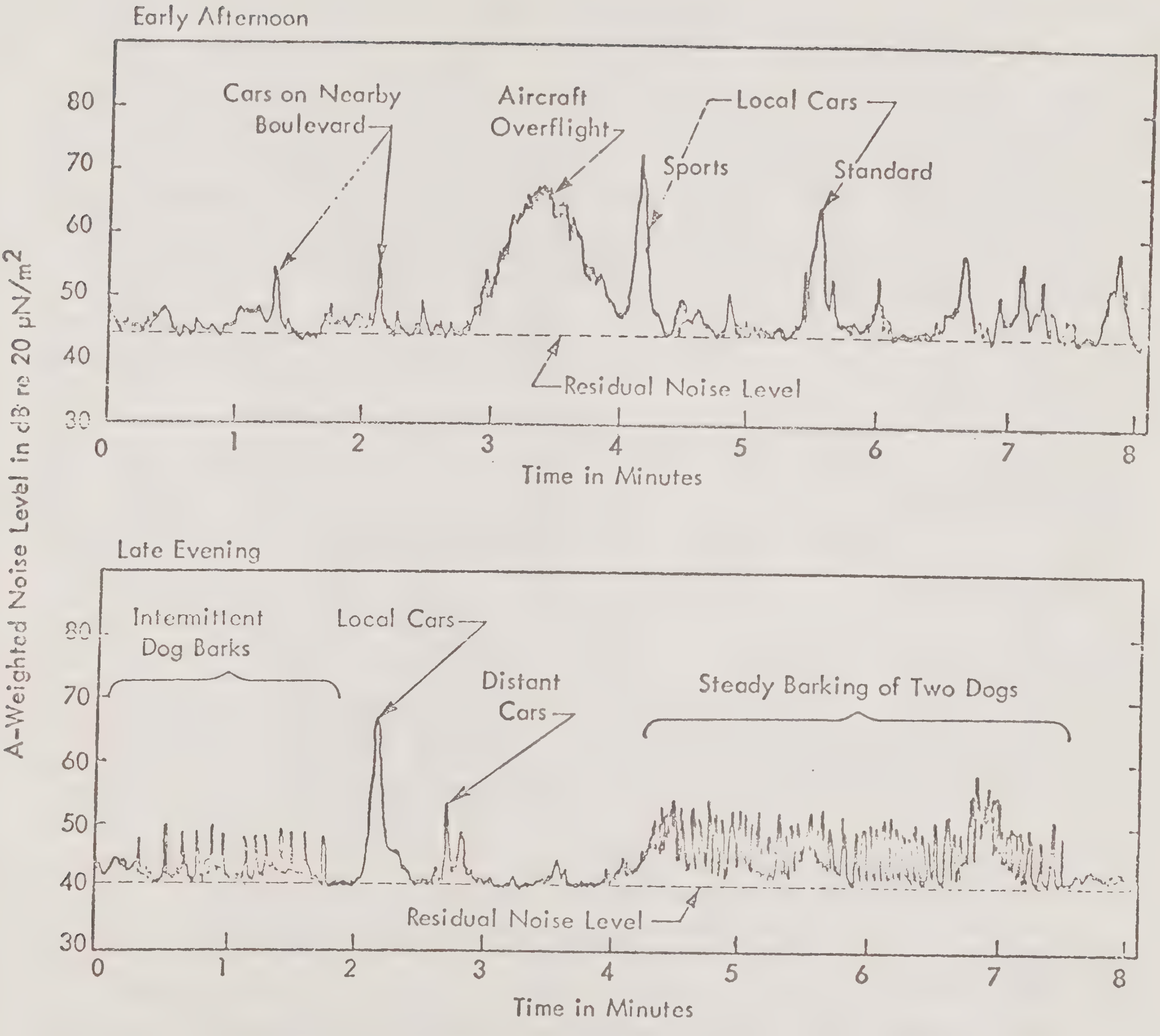


Figure 3-2. Two Samples of Outdoor Noise in a Normal Suburban Neighborhood with the Microphone Located 20 Feet from the Street Curb (Reference 6)

SELECTION CRITERIA	NOISE RATING TECHNIQUE				
	L_{max}	L_{eq}	L_{10}	L_{dn}	CNEL
BASED UPON A-WEIGHTED NOISE LEVEL	X	X	X	X	X
EVENT DURATION CORRECTION		X		X	X
CORRECTED FOR NUMBER OF EVENTS/24 HOURS				X	X
PRESENTLY UTILIZED FOR HIGHWAY ANALYSIS	X	X	X	X	X
PRESENTLY USED FOR AIRCRAFT ANALYSIS				X	X
PRESENTLY USED FOR RAIL-ROAD OPERATIONS				X	X
PRESENTLY USED FOR ANALYSIS OF STATIONARY NOISE SOURCES	X	X		X	X
PROPOSED EPA RECOMMENDATIONS				X	

Figure 3-3. Evaluation of Prospective Noise Rating Scales

and that such variations are not distinguishable by the human ear). Hence, it may be concluded that the L_{dn} scale will be fully compatible with existing noise studies of aircraft operations in California expressed in terms of CNEL noise contours.

L_{dn} has been judged by Wyle to be the preferred noise rating scale over CNEL for assessment of all railroad operations. Operational data which consider an evening time period breakout is, at best, uncertain due to the fact that most railroad companies operate by shifts. The day-night activity volume is more compatible with the existing bookkeeping practices. Additionally, if it is assumed that any operation (rail, air, highway, etc.) is conducted such that the same number of noise events occurs during any hour of the day, evening or night (hence, constant activity volume over the entire 24-hour day), the L_{dn} and CNEL values will differ by only 0.3 dB. Furthermore, as is typically the case for highways, the majority of daily traffic volume will occur during the daytime period; hence, this discrepancy may be assumed negligible.

Finally, it is necessary to evaluate the compatibility of L_{dn} representations of highway traffic noise exposure in light of the two most commonly utilized methods in California; namely, (1) L_{10} for peak flow periods (presently utilized by CALTRANS and required by the FHWA for allocation of federal funds for highway projects), and (2) maximum A-weighted diesel truck noise levels by California Test Method 701-A, also utilized by CALTRANS.

Considering first, L_{10} analysis, recall from the foregoing discussions that the basis of both L_{dn} and CNEL is the equivalent energy level, L_{eq}. Studies performed by Wyle Laboratories for the EPA in the field of environmental noise in which the various noise rating scales were compared for the same sample of noise data have indicated that for noise environments dominated by auto (and truck) traffic noise, the L_{10} level consistently exceeds the L_{eq} (of the same data sample) by 0 to 3 dB. This characteristic pattern is illustrated in Figure 3-4 by hourly values of L_{10} and L_{eq} near a freeway site.[6] If it is assumed that traffic noise obeys a normal gaussian distribution, then the exact relationship shown in Equation (1) exists between L_{10} and L_{eq}.

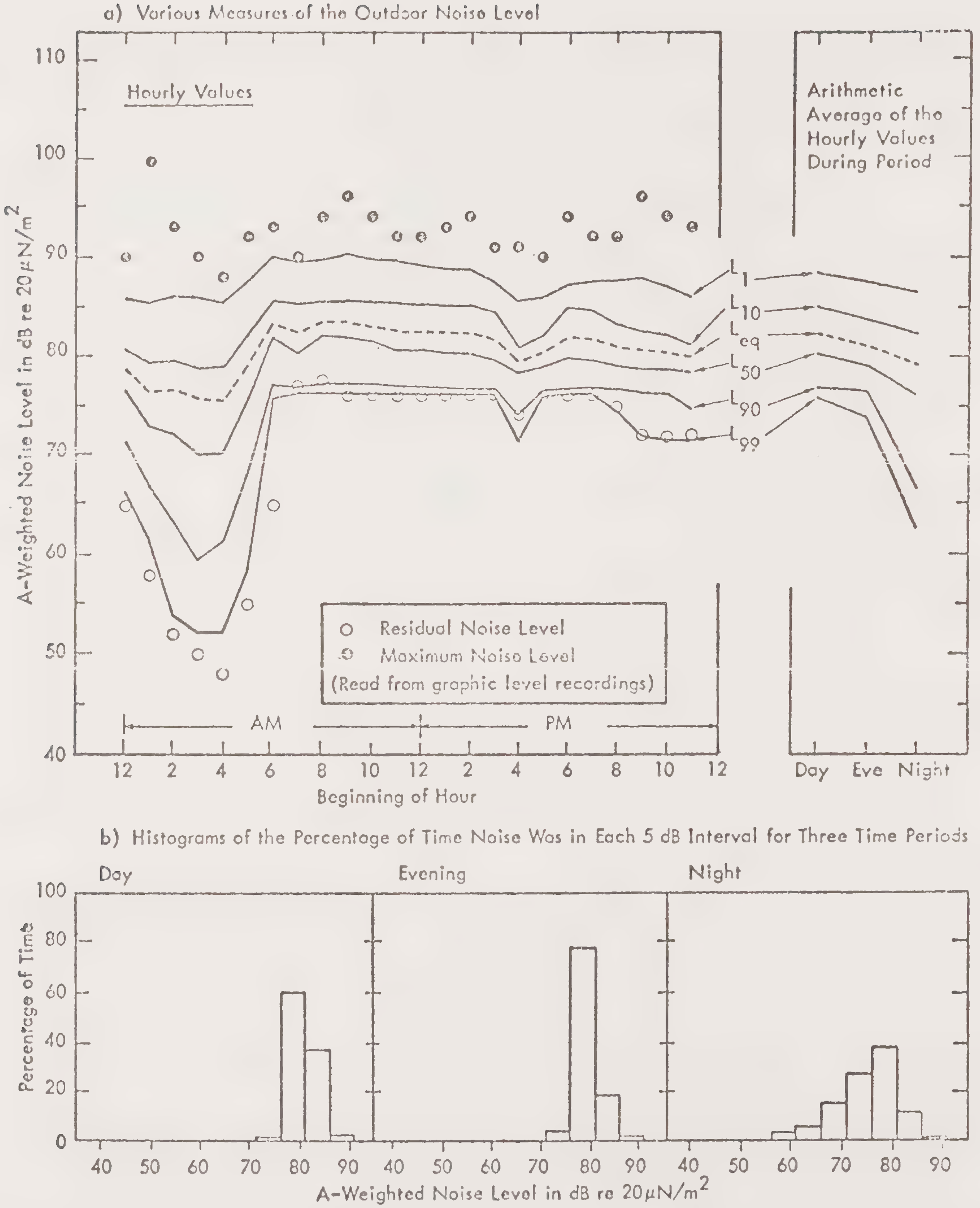


Figure 3-4. Summary of the 24-Hour Outdoor Noise Levels at Location A – Third Floor Apartment, Next to Freeway (Reference 6).

$$L_{10} = L_{eq} + 1.28\sigma - .115\sigma^2 \qquad (1)$$

where

σ represents the standard deviation of the traffic noise data which typically ranges from 2 to 4 dB.

The noise level information obtained via the California 701-A method is based upon field measurement data of maximum A-weighted noise levels produced by diesel trucks. The noise contours resulting from this method present maximum noise levels in dBA from truck operations versus distance from the roadway. It is, however, not possible to correlate L_{dn} or L_{10} values with these peak levels in that neither the number of such occurrences nor the time at which they occur are known. Furthermore, the intrusiveness of a given single event (i.e., a truck passby) depends upon the amount by which its maximum value exceeds the mean traffic noise level. Thus, for sparsely flowing traffic conditions, trucks may be very significant while in the case of freely flowing dense traffic at relatively high speeds, the truck components become less significant.

3.4 Computation of Noise Contours

The noise contour methodology applied in the calculation of transportation systems was developed by Wyle Research staff. These techniques have become widely accepted as useful planning tools and employ the most current data on source noise and source noise modification and attenuation.

3.4.1 Basis for Computation of Ground Transportation Noise Contours for the City of Huntington Beach

Highway Noise Contours

Introduction

The procedures for calculating the noise contours for highways and freeways are illustrated in Figure 3-5. The basic steps may be summarized as follows:

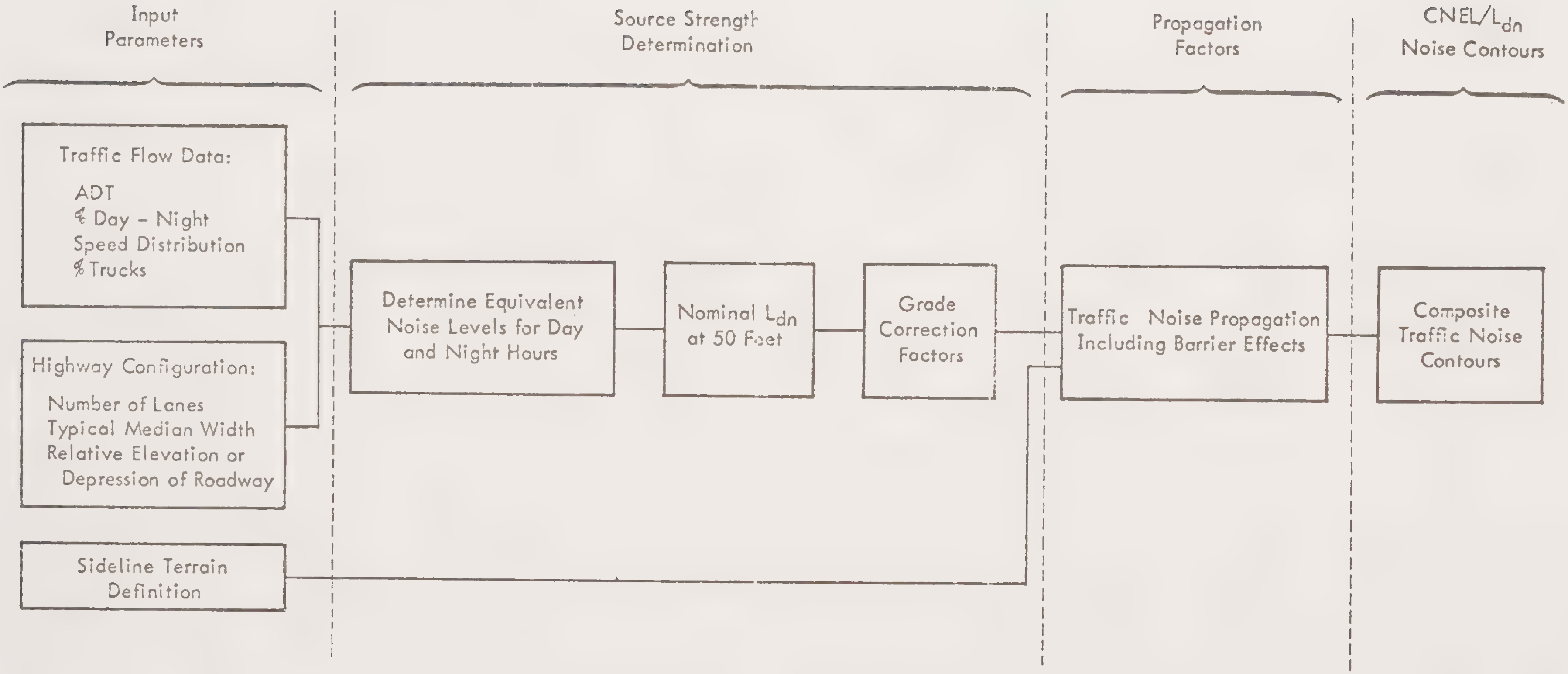


Figure 3-5. Flowchart for Development of CNEL/L_{dn} Contours of Highway Traffic Noise

1. Define the specific roads to be considered in the analysis.

2. Define traffic flow parameters for each road to be analyzed. These factors will include Average Daily Traffic (ADT - on an annual basis), traffic distribution by day and nighttime time periods, typical vehicle speeds and percentage of trucks.

3. Define highway configuration in terms of use classification, number of lanes, typical median width and relative elevation or depression with respect to the sideline terrain.

4. Define sideline terrain characteristics for use in propagation analyses.

5. Analyze current automotive and truck noise reduction technology and legal constraints, and estimate noise output characteristics for future time periods.

6. Evaluate the cumulative noise levels emitted by current and projected highway traffic in terms of vehicle speed, traffic density, flow, and lane distribution by vehicle class. This analysis results in determination of day and night equivalent noise levels (L_{eq}) which may then be summed logarithmically to yield the CNEL or day-night average sound level L_{dn}, at a reference distance of 50 feet.

7. Adjust nominal CNEL/L_{dn} values at 50 feet for the effect of highway grades on vehicle noise output.

8. Given the highway configuration and sideline terrain characteristics, analyze traffic noise propagation into the surrounding community considering such variables as spreading losses, air absorption, excess ground attenuation, highway barriers, and miscellaneous acoustic barriers.

9. Combine these data to yield CNEL/L_{dn} noise contour values versus distance from the roadway.

A stepwise method, based upon a computerized traffic noise prediction model, has been developed by Wyle Research to allow further analysis of highway noise by city planners or highway engineers based on the foregoing procedures. This method, presented in Appendix D, permits manual computation of CNEL or L_{dn} contours values.

The following sections provide an expanded explanation of the methods and assumptions incorporated in the stepwise procedure.

Sources of Input Data

Traffic Flow Data

Traffic volumes in this study are expressed by the average number of vehicles which pass a section of roadway over the 24-hour day and is termed the Average Daily Traffic (ADT). The source of ADT information was the Huntington Beach Planning Department. All ADT data for freeways, arterials, collectors, and local streets of interest for current traffic flow were given on Huntington Beach Planning Department traffic count maps. The percentage of the average number of trucks on the various streets in Huntington Beach was also furnished by the City's Planning Department.

Traffic speeds for arterial, collector, and local streets were provided by the Huntington Beach Planning Department. The legal speed limit on the San Diego Freeway of 55 miles per hour was assumed the typical speed of automobiles and trucks along this stretch of road. Realistically, traffic on freeways and arterials exceeds the legal speed limit and thus creates increased noise. Strict enforcement of speed laws will therefore not allow contour widths to increase unduly.

The distribution of vehicles over the 24-hour day was assumed to be 87 percent of the ADT traveling during daytime hours (7:00 a.m. to 10:00 p.m.) and 13 percent of the ADT traveling in the nighttime hours (10:00 p.m. to 7:00 a.m.). These distribution values were derived in a CALTRANS study of road systems in Southern California and are consistent with present Huntington Beach information.

A complete record of data used to generate the noise contours is listed on the Noise Analysis Worksheet in Appendix E.

Roadway Configurations

Roadway configuration data, such as lane width, number of lanes and median width for arterials, collectors, and local streets, were obtained from the Huntington Beach Planning Department. A complete listing of these configuration data is given in the Highway Noise Analysis Worksheets under a separate attachment.

Available literature predicting decreases in traffic noise level due to the shielding effect of foliage and buildings is quite limited and somewhat ambiguous. Because of the complexity and unreliability of predicting attention from local trees, scrubs, and buildings, correction factors were not warranted. Barrier walls along arterials effect noise propagation in a somewhat predictable manner and are therefore included in the analysis in Section 3.8.3.

Method of Computation of Highway Traffic Noise

Description of Traffic Noise Computer Program

The computer program utilized for predicting noise contours is based on the summing of noise from each individual vehicle. Noise from a single vehicle is generally specified by the maximum level measured as the vehicle drives by on a straight road at a standard distance (usually 50 feet) from an observer. This is referred to as the maximum passby level. Noise at other points in time, or for distances other than 50 feet, can be computed as a function of distance between vehicle and observer.

Computation of Equivalent Noise Level, L_{eq} (the basis for formulation of CNEL/L_{dn}) requires adding the acoustic energy of all vehicles and averaging over time. The program first does this for each lane individually. The time averaging process makes the result independent of spacing between individual vehicles; only average traffic density need be known. After averaging over time, each lane becomes an acoustic line source of strength proportional to average peak passby level and vehicles per mile. The average peak passby level is based on the peak passby level of each class of vehicles (e.g., cars, trucks) weighted according to the percentage of

each and is a function of speed. The number of vehicles per mile is the traffic flow (vehicles per hour) in that lane divided by average speed. For multilane roads where only overall traffic flow and percentage trucks are given, the program sets the flow in each lane in terms of a standard distribution based on lane by lane traffic count data. Speeds in each lane are set to standard values based on data for similar roads.

After computing the equivalent line source strength of each lane, L_{eq} for the total highway traffic is computed by adding acoustic energy from all lanes. The distance between observer and each individual lane is used in this computation. Traffic noise levels decrease as traffic lane to observer distance increases due to natural spreading of sound and various additional sound attenuating effects. Appropriate noise reduction factors have been included in the computer program.

Maximum Vehicle Passby Noise Levels

For the purposes of this study, highway vehicles were represented as being comprised of two classes: cars and heavy trucks. Light trucks (e.g., pickups and vans) are similar in construction to automobiles and have similar noise characteristics. Special vehicles, such as motorcycles and dune buggies, do not exist in sufficient quantity to be an important factor in this study and were therefore not treated separately.

Current Vehicle Noise Levels

The prediction of present noise contours utilized values of peak passby level as a function of speed contained in the program. These were based on data on cars and trucks in the available literature[9] and recent truck data collected by Wyle.[10] Figure 3-6 summarizes current noise data for cars in the form of average peak passby levels as a function of speed. The program utilizes these data for cars and assumes a standard deviation of 2.5 dB for the peak levels.

Considerable progress has been made in recent years in the reduction of truck noise. More information was desired to reflect this progress; hence, recent data collected by Wyle Research from several thousand trucks, measured in California and in several other states, were used to upgrade the noise model for standard trucks. The

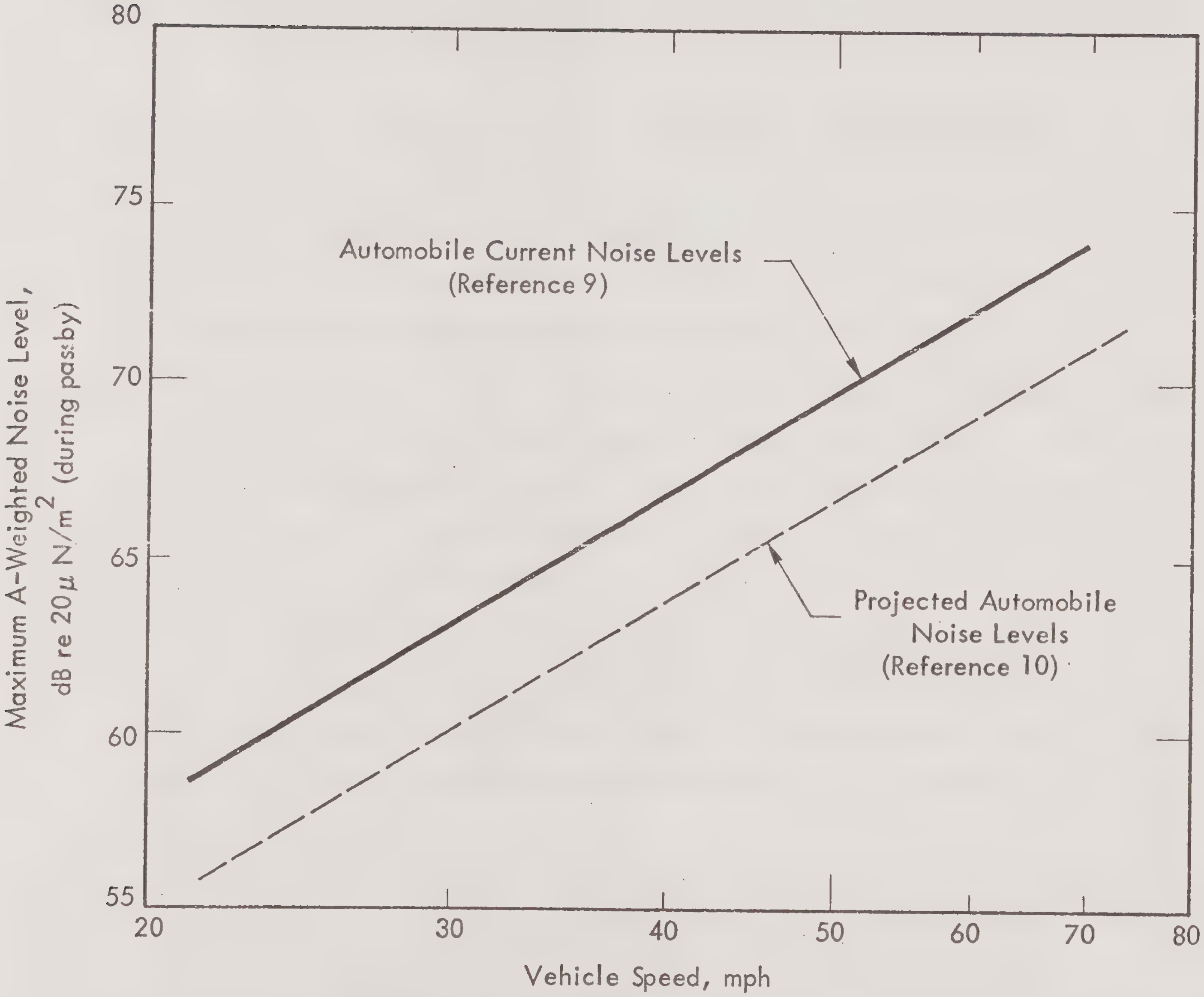


Figure 3-6. Maximum Passby Noise Levels of Automobiles at 50 feet for Current and Forecast Time Periods (Curves Established from Average Values of Available Data at Each Speed)

resulting noise output characteristics predicted for California trucks are summarized in Figure 3-7, the standard deviation of these predicted levels is about 3 dB. The data indicate that California trucks typically produce 5 dB less noise than the national sample. Therefore, it was important to this study that the regional variation in truck noise be accounted for.

Forecasted Vehicle Noise Levels

Projected noise levels for passenger cars in future time periods are based upon a Wyle study performed for the Environmental Protection Agency (EPA) in December 1971.[11] This study assessed potential legal constraints (particularly, the California Vehicle Code, Section 27160, "Motor Vehicle Noise Standards") and application of available technology to predict peak passby noise levels for the intermediate and long term future. It has been assumed that the noise output characteristics of automobiles will be essentially similar to current vehicles; however, their levels will be decreased by 3 dB over the normal operating range as shown in Figure 3-6. It has been further assumed that for future time periods, barring a major breakthrough in tire noise reduction, truck noise at highway speeds would be primarily controlled by tire noise and thus may exhibit a 4 to 7 dB decrease over current levels, depending on vehicle speed. This assumed noise output versus speed is shown in Figure 3-7. The steeper slope for the future curve is deemed more representative of the speed sensitivity of the tire noise controlled component.

Highway Grade Correction Factors

Grade correction factors have been applied to trucks only. It is assumed that even on severe grades, automobile noise output will remain virtually unaffected. It is further assumed that grade correction factors apply only to upgrades; hence, only the uphill side of a highway receives modification. The downgrade side of the road should be treated as though no grade condition exists. The specific grade corrections as applied to the truck noise output are presented in Appendix B.

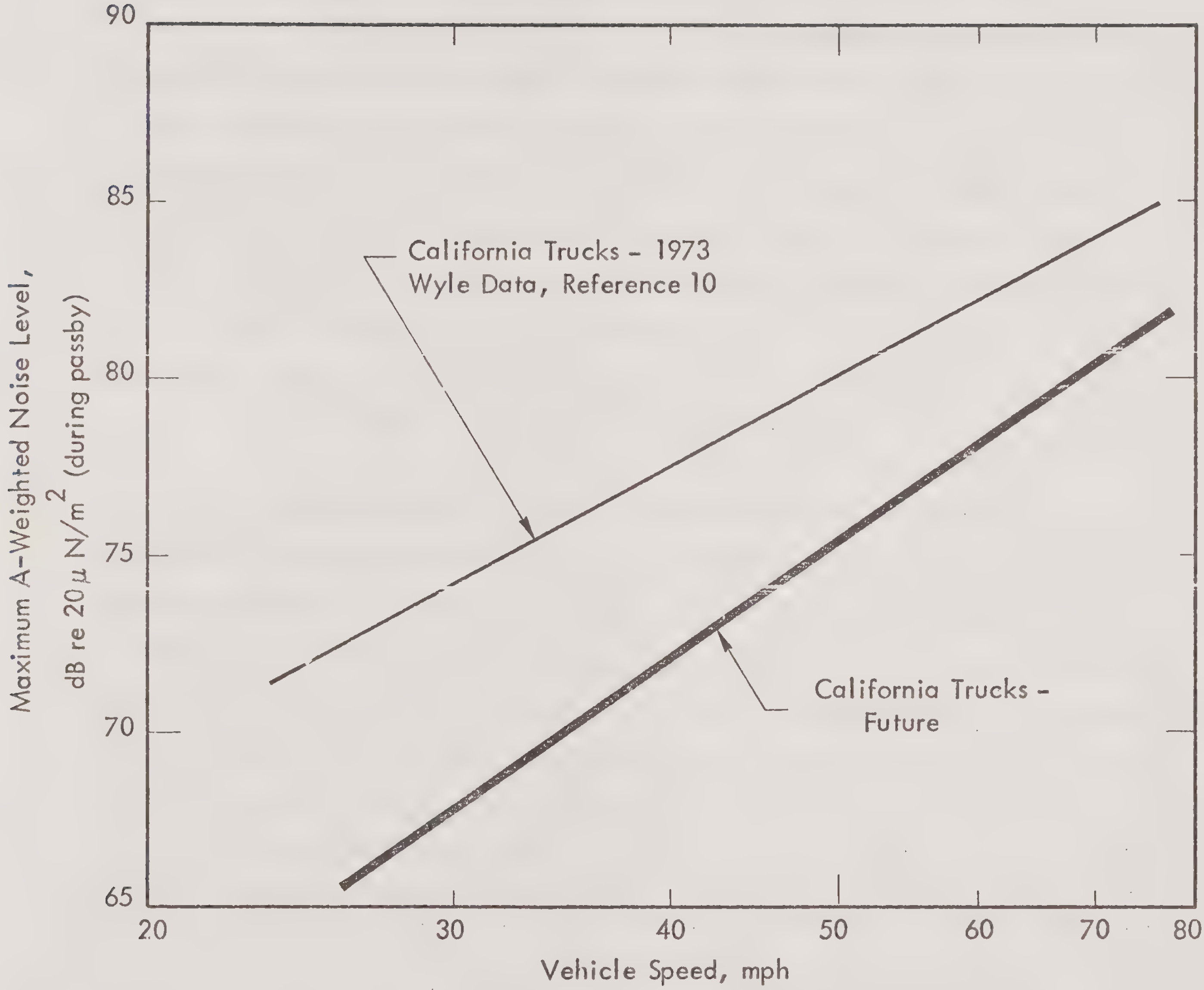


Figure 3-7. Maximum Passby Noise Levels of Heavy Trucks at 50 feet for Current and Forecast Time Periods (Curves Established for Average Values of Available Data at Each Speed)

Traffic Noise Propagation

The method discussed thus far is mainly concerned with development of the noise source strength, expressed in terms of L_{dn} or CNEL at a reference distance of 50 feet from the center of the outermost lane of traffic. Thus, the final step in development of noise contours along a roadway is the analysis of the sound propagation from the flowing traffic. The stepwise computation method presented in Appendix D takes into account several factors which affect sound attenuation. These include geometrical spreading losses and additional losses resulting from air absorption and excess ground attenuation for flat terrain. These two additional factors are dependent upon the spectral content of the noise, temperature, and relative humidity (standard atmospheric conditions of 59°F and 70 percent relative humidity were assumed).

A nominal decrease of road traffic noise (on an energy basis) of 4 dB per doubling of distance was incorporated in the analysis. At approximately 400 feet, the influence of the additional attenuation factors becomes significant. These propagation characteristics are illustrated in Figure B-7, Appendix B. Additionally, the effect of elevated or depressed highway rights-of-way was considered in the analysis. Propagation curves were developed for highways elevated 20, 30, and 40 feet and for a 30 foot depressed configuration with a 2:1 sidewall slope. It was determined that these configurations would adequately cover the vast majority of terrain conditions in Southern California and would provide a conservatively oriented analysis.

3.4.2 Railroad Noise Contours

Line Operations

The CNEL/L_{dn} noise contours are composed of the logarithmic energy summation of Single Event Noise Exposure Levels (SENELs) for train passbys over the 24-hour day with weighting applied to nighttime operations. Train passby SENELs are subdivided into the locomotive and railroad car contributions.

A flowchart illustrating the development of CNEL/L_{dn} contour calculations is given in Figure 3-8. This flowchart corresponds to an elaborate calculation procedure given in Reference 13. Although the railroad line operation contours were evaluated by this procedure, a simplified methodology is also given in Appendix E which enables quick calculations of the approximate positions of L_{dn} contours.

The only railroad line considered potentially annoying was the Southern Pacific Transportation Company's branch line that runs north and south and lies near Gothard Street. Operations were limited to one per day and no movements at night. Typical train speeds were 15 miles per hour and each train consisted of nominally 12 cars.

<u>Noise Contours Around Railroad Yard Operations</u>

Development of the L_{dn} yard noise contours was accomplished by the four-phase process illustrated in the flowchart in Figure 3-9.[13] As shown, the four phases consisted of: accumulation of input data, computations, development of discrete noise contours for individual sources, and development of the composite L_{dn} noise contour for the entire yard. Generally, seven dominant yard noise sources are considered in the generation of noise contours. These major elements consist of: hump engine movement, master and group retarder screech, inert retarder screech, switcher classification operations in concentrated areas, idling mechanical refrigerator cars, idling locomotives, and diesel locomotive load tests. Implementation of the contour calculation procedure outlined in Figure 3-9 requires an understanding of the complex interrelationship between railroad yard operations and the noise generated by the yard's associated sources. A thorough discussion of the subject is lengthy and beyond the scope of this report. Documentation of railroad yard noise analysis is found in Reference 13.

The sole significant contributor of noise from yard operations was found to be the switching of cars at the spur near Atlanta Avenue. At this switching lead,

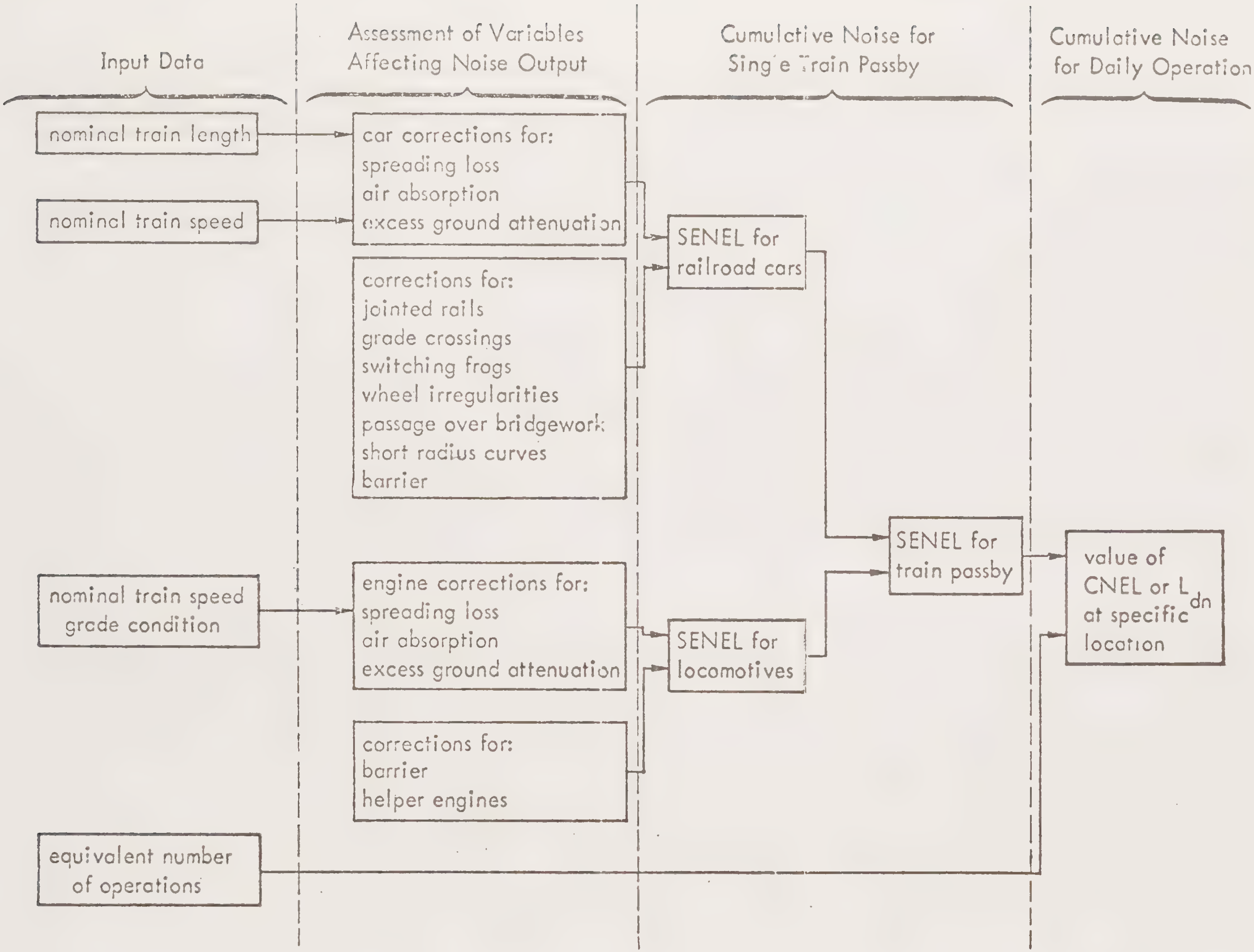


Figure 3-8. Flowchart for Development of CNEL/L_{dn} Contours for Railroad Line Operations

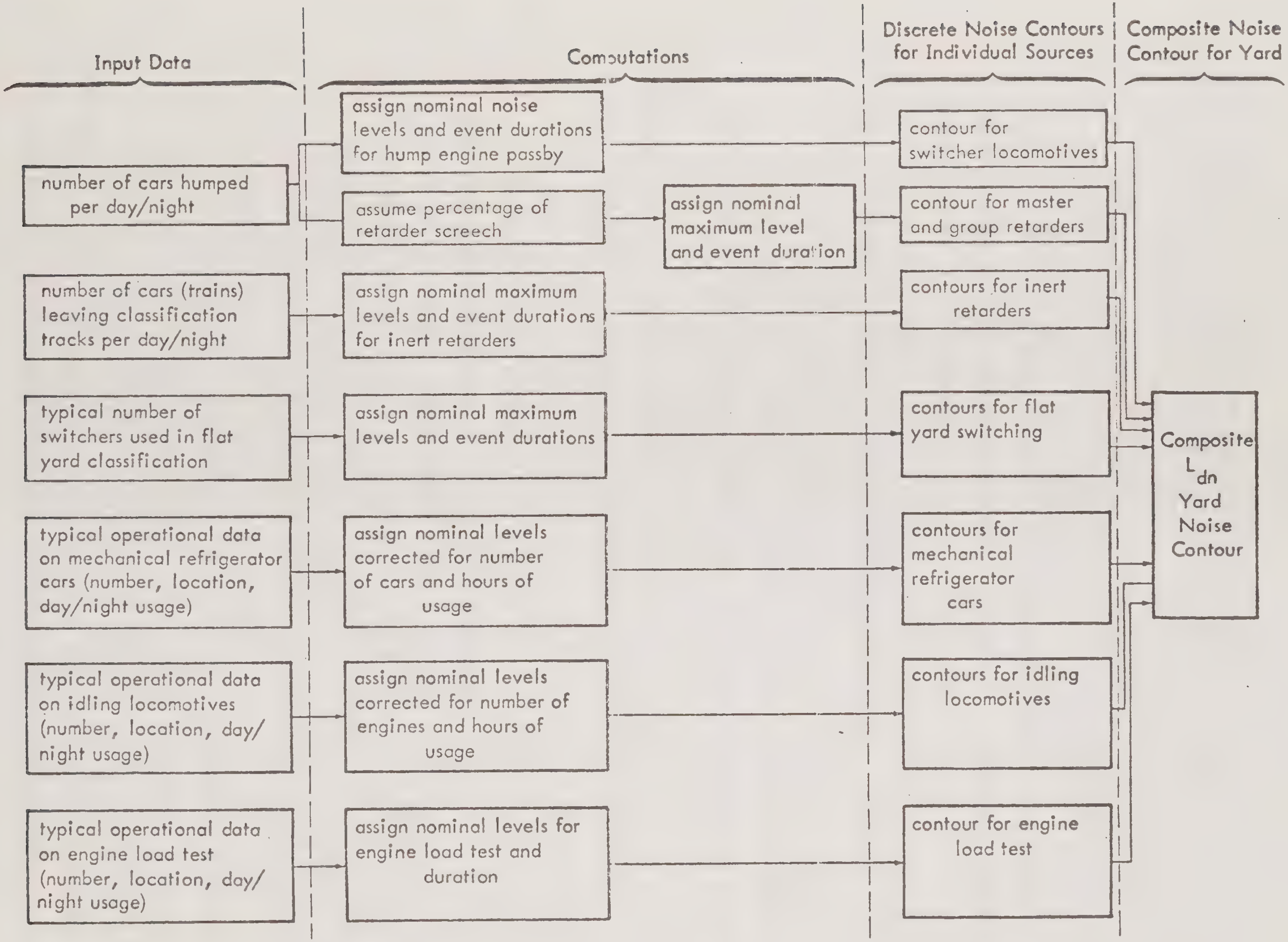


Figure 3-9. Flowchart for Determination of L_{dn} Noise Contour Values for Railroad Yard Operations

switching operations are assumed to typically occur between 11:00 a.m. and 12:00 a.m. and between 1:00 p.m. and 2:00 p.m. The locomotive is assumed to idle between 12:00 a.m. and 1:00 p.m.

3.4.3 Aircraft Noise Contours

The method used in this report for estimating the noise impact boundary location at Meadow Lark Airport is based on a simplified model for aircraft operations at small and medium size airports developed by Wyle.[16] Specifically, the method considers only one runway and defines the noise impact boundary in terms of the relative mix of general aviation propeller aircraft and the total number of operations, weighted by their time of occurrence. A wide variety of operating conditions can be covered with a standard set of noise contours. The method is expedient and requires only a few hand calculations and tracings or graphic interpolations from a set of preplotted contours.

3.5 Noise Contours for Huntington Beach

Introduction

Description of the noise environment for Huntington Beach has been expressed in terms of L_{dn} noise contours for road systems and railroad operations and CNEL noise contours for aircraft operations. As mentioned in Section 3.3, the L_{dn} and CNEL noise rating scales are fully compatible with each other and deviations between the two scales cannot even be detected by the human ear for even the most stringent case. In general, the noise contour values presented for this analysis have an error tolerance estimated to be ±3 dB. Note that 3 dB is the minimum shift in noise level that can normally be detected by the human ear.

Contours are calculated for all cases down to 60 dB in 5 dB intervals. Extrapolations below 60 dB decrease in reliability and these extrapolations may indeed be below the ambient noise level of the community. The position of contours within 50 feet of a roadway cannot be drawn with any precision on contour

maps employing the usual scale factors of 1 inch = 800 feet or greater. Contour line widths themselves become 30 to 50 feet in this case. Therefore, for Huntington Beach, contours which are calculated to lie within 50 feet of the road are drawn tangential to the edge of the roadway. If the 60 and 65 L_{dn} contours are both within 50 feet of the road, the contours will be shown adjacent to one another along the edge of the outside lane. Note, however, that, in all cases, contours are located properly when they lie greater than 50 feet from the roadway.

3.5.1 Freeway, Arterial, and Collector Roadway Contours

The large scale Surface Transportation Noise Contour Maps, included as an attachment to this report, illustrates the positions of the L_{dn} noise contours for the present and 1990 Huntington Beach roadway system in detail. A reduced version of these detailed maps is provided in Figures 3-10 and 3-11. Documentation of distances between the center of the outermost lane and the 60, 65, and 70 L_{dn} contours are provided in the Highway Noise Analysis Worksheets.

It should be noted that these noise contours do not reflect noise reduction by barrier walls adjacent to arterials. The effect of walls were not included because of the difference of noise exposure to the first and second floors of a building with arterial shielding by a nominal 6-foot wall, as discussed in Section 3.8.3. Discounting wall attenuation is highly recommended when analyzing the acoustical environment of future multistory structures. On the other hand, the wall effectiveness methodology in Section 3.8.3 can be used for single-story buildings.

3.6 Land Use Compatibility Guides

Figure 3-12 provides the key to the selection of the appropriate land use/noise compatibility situations for differing L_{dn} values. For each land use listed in the figure, several interpretations are provided. The choice of the appropriate interpretation is governed by the L_{dn} values describing the noise exposure.

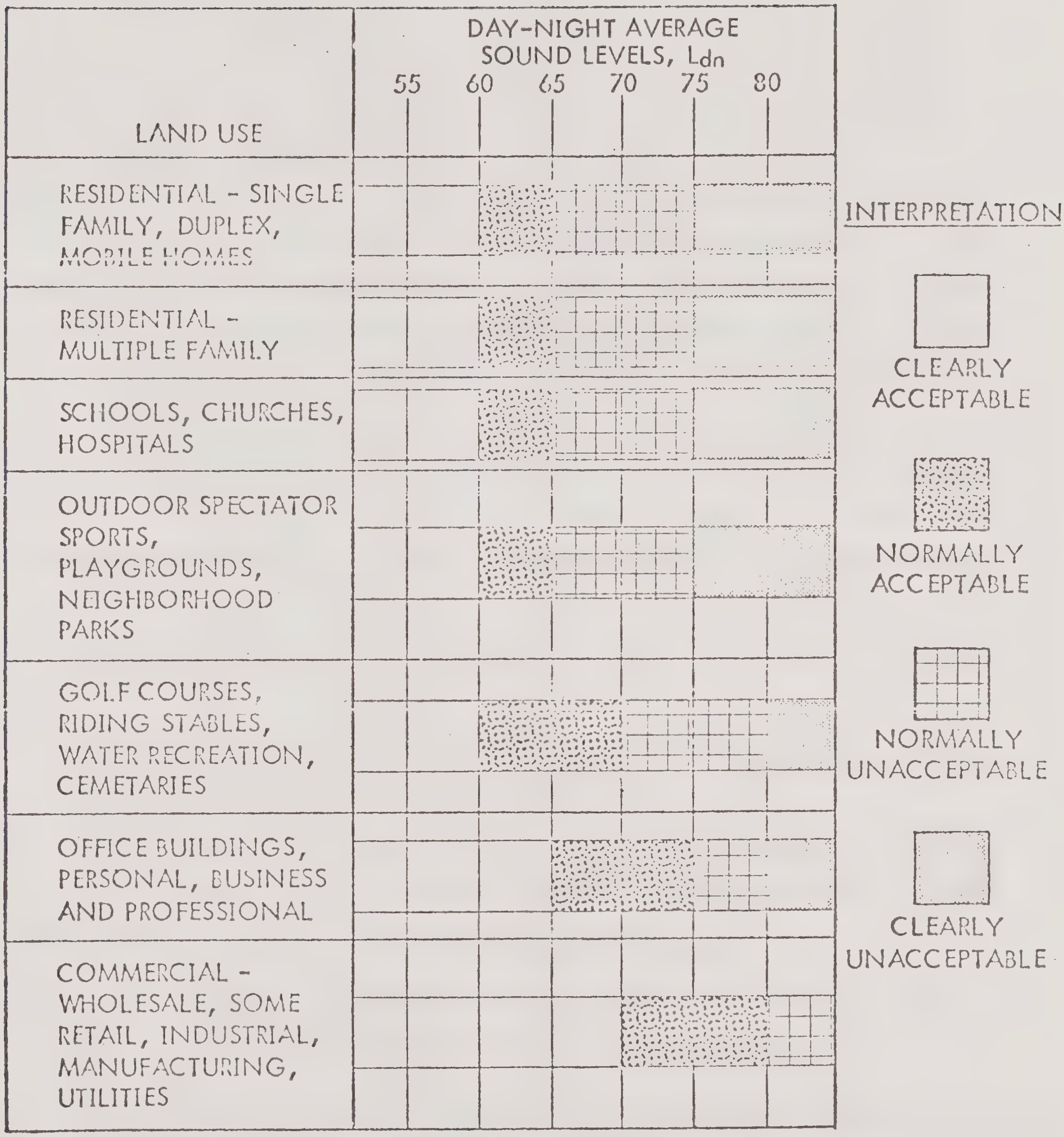
HUNTINGTON BEACH, CALIFORNIA
PLANNING DEPARTMENT

GROUND TRANSPORTATION
NOISE EXPOSURE CONTOURS 1974
PREPARED BY WYLE RESEARCH

Figure 3-10

HUNTINGTON BEACH, CALIFORNIA
PLANNING DEPARTMENT

GROUND TRANSPORTATION NOISE EXPOSURE 1990



*For purposes of comparison, L_{dn} values are approximately equal to CNEL values, i.e., L_{dn} 65 may be compared with CNEL 65.

Figure 3-12. Recommended Guidelines for Environmental Noise Criteria for Compatible Land Use

In Figure 3-12, one will note that, for most land uses, the compatibility interpretation for the lowest L_{dn} values has the notation "clearly acceptable" with no special noise insulation requirements required for new construction, indicating that there should be no adverse effects from transportation noise. Corresponding to higher levels of noise exposure, the interpretations generally define a range of noise exposure in which new construction or development should not be undertaken unless an analysis of noise requirements is made and needed noise insulation features are included in the building design and site development. For more extreme noise exposure, many of the land uses are assigned an interpretation saying that new construction or development should not be undertaken. There may be considerable variability in people's reaction to noise or assessment of a given noise environment. In addition, any given land use category may incorporate a range of activities having varying sensitivities to noise. Further, there may be a considerable range in noise insulation of buildings that might be found suitable for a given work activity. Taking into account such variables, the noise compatibility interpretations must be used as guides to land use planning and should not be blindly applied as inflexible criteria.

To provide for some degree of flexibility in setting limits, the L_{dn} range of many of the compatibility interpretations in Figure 3-12 provide a range of L_{dn} values where boundaries may be modified by local considerations.

Major factors to consider in adjusting or selecting a specific L_{dn} criteria for a given land use include the following:

a. Previous community experience. One may utilize past experience in selection of boundaries, taking into consideration known response or complaint history in previously developed areas which are exposed to similar L_{dn} values. Such experience may aid in selection of L_{dn} descriptor boundaries with limits indicated in Figure 3-12.

b. Local building construction. The quality and type of wall and roof constructions are among the most effective way of reducing the number of noise leakage paths. This is also one of the key areas of control by the City through its local building and safety codes.

c. Time period of land use activities. The basic L_{dn} values as developed by the equations consider both daytime and nighttime operations, with a weighting factor for nighttime operations. This procedure is particularly appropriate for residential land use considerations, but may lead to over estimation of L_{dn} values for work activities or land uses which are confined to daytime hours only. Thus, it may be desirable to adjust L_{dn} boundary limits to define the noise exposure for only daytime operations.

It is important to point out that when one wishes to determine the specific noise insulation required for a given work activity, definition of the noise environment in terms of the L_{dn} value alone is insufficient. In general, one must supplement the L_{dn} value by more detailed specification of the magnitude of noise intrusion for a particular application.

This must often be followed by more detailed description of the noise events in terms of octave band noise spectra and signal duration considerations, as well as knowledge of the background noise levels and interior noise criteria. These steps follow well-defined noise control procedures.

A general perspective of land use compatibility for Huntington Beach can be obtained by applying the guidelines in Figure 3-12 to the surface transportation and Meadow Lark Airport L_{dn} contour maps. All noise-sensitive uses, such as single family residential, etc., which lie within any L_{dn} 65 or greater contour, may be considered a general indication of incompatible land use.

The interpretations of what noise levels may generally be considered acceptable or unacceptable as a function of land use category in Figure 3-12 are expressed in more definitive terms below by construction type descriptors.

Compatibility Interpretation	Construction Type Descriptors
Clearly Acceptable	Specified land use is satisfactory, based on the assumption that any buildings involved are of normal construction, without any special noise insulation requirements.
Normally Acceptable	New development or construction should be permitted only on condition that a detailed analysis of requirements for building noise reduction performance be made and indicated noise insulation and air supply features be included in the design and construction.
Normally Unacceptable	New development or construction should be undertaken only if special noise insulation and air supply features are included in the design and construction
Clearly Unacceptable	A detailed analysis of the noise environment, considering noise from all urban and transportation sources should be made, and needed noise insulation features and/or special requirements for sound reinforcement systems should be included in the basic design.

It should be noted that the State of California Department of Housing and Community Development enacted new standards under Title 25: Housing and Community Development, Chapter, 1, State Housing Law Regulations, Earthquake Protection Law Regulations, and Painting Standards, March 23, 1974 (see Table 3-7).[8] This standard specifies that structures other than detached single-family dwellings, to be located within an annual CNEL contour of 60 (from airport, vehicular, and industrial noise sources), require an acoustical analysis showing that the structure has been designed to limit intruding noise to the prescribed allowable levels, i.e., the interior CNEL with windows closed, attributable to exterior sources, shall not exceed an annual CNEL of 45 dB in any habitable room. This standard is significantly more conservative.

Article 4. Noise Insulation Standards

1092. **Noise Insulation Standards.** (a) Purpose. The purpose of this article is to establish uniform minimum noise insulation performance standards to protect persons within new hotels, motels, apartment houses, and dwellings other than detached single-family dwellings from the effects of excessive noise, including but not limited to hearing loss or impairment and persistent interference with speech and sleep.

(b) Application and Scope. The provisions of this article relating to noise insulation performance standards apply to new hotels, motels, apartment houses and dwellings other than detached single-family dwellings.

These regulations shall apply to all applications for building permits made subsequent to the effective date of these regulations.

These regulations shall be effective 6 months after the adoption by the Commission of Housing and Community Development.

[illegible] Definitions. The following special definitions shall [illegible] this [illegible] applicable:

(e) Noise Insulation from Exterior Sources.

(1) Location and Orientation. Consistent with land use standards, residential structures located in noise critical areas, such as proximity to select system of county roads and city streets (as specified in 186.4 of the State of California Streets and Highways Code), railroads, rapid transit lines, airports, or industrial areas shall be designed to prevent the intrusion of exterior noises beyond prescribed levels with all exterior doors and windows in the closed position. Proper design shall include, but shall not be limited to, orientation of the residential structure, set-backs, shielding, and sound insulation of the building itself.

(2) Interior Noise Levels. Interior community noise equivalent levels (CNEL) with windows closed, attributable to exterior sources shall not exceed an annual CNEL of 45 dB in any habitable room.

(3) Airport Noise Source. Residential structures to be located within an annual CNEL contour (as defined in Title 4, Subchapter 6, California Administrative Code) of 60 require an acoustical analysis showing that the structure has been designed to limit intruding noise to the prescribed allowable levels. CNEL's shall be as determined by the local jurisdiction in accordance with its local general plan.

(4) Vehicular and Industrial Noise Sources. Residential buildings or structures to be located within exterior community noise equivalent level contours of 60 dB of an existing or adopted freeway, expressway, major street, thoroughfare, railroad or rapid-transit line shall require an acoustical analysis showing that the proposed building has been designed to limit intruding noise to the allowable interior noise levels prescribed in Section 1092(e) (2).

Exception: Railroads, where there are no nighttime (10:00 p.m. to 7:00 a.m.) railway operations and where daytime (7:00 a.m. to 10:00 p.m.) railway operations do not exceed four (4) per day.

(f) Compl[illegible] [illegible]ance shall consist of submittal [illegible] the supe[illegible]

Table 3-7. Noise Insulation Standards

The EPA has also issued new criteria levels for indoor and outdoor noise exposure. These are listed in Table 3-8. Figure 3-13 compares these levels with typical urban levels. It is apparent that there exist a number of conflicting criteria levels. For the purpose of planning for land use compatibility for new residential and noise-sensitive institutional uses, the L_{dn} 60 level appears reasonable.

The subsequent sections describe the measurement methodology used; the results in defining the community noise environment; mitigating measures and criteria levels applicable to reduce various noise sources to acceptable levels; a draft Noise Ordinance; and the EIS.

3.6.1 Residential/Institutional Transportation Noise Impact and Compatibility

Applying the criteria in Figure 3-12 for compatible land use, the transportation noise impact for Huntington Beach was identified for all residential/institutional uses up to and including CNEL 60. This was simply accomplished by overlaying the transportation noise contours (Figures 3-10 and 3-11) with the present and projected land use maps provided by the City Planning Department. It is apparent from Figures 3-14 and 3-15 that the amount of potentially noise-sensitive land is significantly increased in many areas as a result of the changes in land use and increased traffic volumes which are projected to occur between the present and 1990. The criteria level of L_{dn} 60 appears to be a reasonable goal to achieve for outdoor noise in residential areas and would be compatible with the new California Noise Insulation Standards identified in Table 3-7.

3.6.2 Railroad Contours

Line Operations

Calculations were performed in accordance with the railroad line contour methodology described in Section 3.4.2. Conclusions of the railroad line noise analysis for Huntington Beach reveal that, for the sections of line analyzed, both L_{dn} 60 and 65 contours fall within the immediate right-of-way of the track (less than 50 feet from track). Thus, all property bordering the railroad right-of-way may be

	Measure	Indoor: Activity Interference	Indoor: Hearing Loss Consideration	Indoor: To (d) protect against both effects	Outdoor: Activity Interference	Outdoor: Hearing Loss Consideration	Outdoor: To (d) protect against both effects
Residential with outside space and Farm Residences	L_{dn} $L_{eq(8)}$	45	75	45	55	75	55
Residential with no outside Space	L_{dn} $L_{eq(8)}$	45	75	45	b	75	75
Commercial	$L_{eq(8)}$	b	75	75	b	75	75
Transportation	$L_{eq(8)}$	70	75	70			
Occupational	$L_{eq(8)}$	b	75	75	b	75	75
Hospitals	L_{dn} $L_{eq(8)}$	45	75	45	55	75	55[c]
Educational	$L_{eq(8)}$	45	75	45	55	75	55[c]
Recreational areas and areas for mechanical devices	$L_{eq(8)}$	b	75	75	b	75	75
Farm land and general wilderness area	$L_{eq(8)}$				b	75	75
Buffer zones between noise sources and populated areas		No level identified since area is not recommended for human activity.					

CODE:
- a. Levels to be measured at locations normally occupied on statistical basis by people.
- b. There is no data available which would allow identification of a maximum level for this effect. Table E-10 of appendix E may be appropriate for certain areas or activities.
- c. Outdoor levels may be raised by up to 20 dB provided that the indoor condition can be achieved and no outdoor space is used for living activities.
- d. Based on lowest of level.

Table 3-8

Maximum L_{dn} or L_{eq} Values[a] in dB Identified with the Onset of Health and Welfare Effects of People[4] (Reference 23)

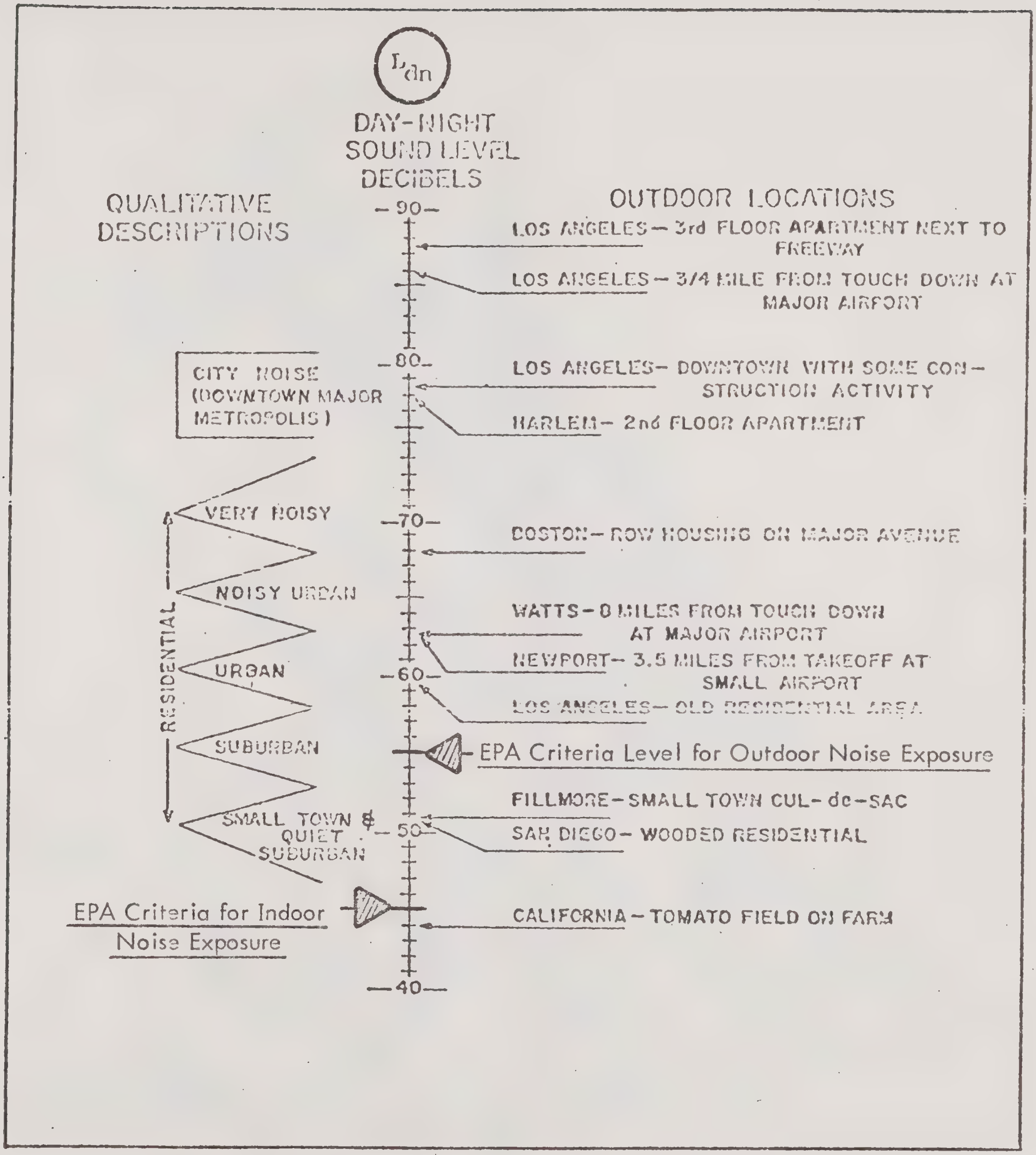


Figure 3-13. Outdoor Day-Night Sound Level in dB at Various Locations (Reference 23)

HUNTINGTON BEACH, CALIFORNIA
PLANNING DEPARTMENT

PRESENT GROUND TRANSPORTATION NOISE EXPOSURE IMPACT ON RESIDENTIAL/INSTITUTIONAL LAND USE

PREPARED BY WYLE RESEARCH

Note:
Solid Black Areas Denote Impact Area

Figure 3-14

HUNTINGTON BEACH, CALIFORNIA
PLANNING DEPARTMENT

GROUND TRANSPORTATION NOISE EXPOSURE IMPACT
ON RESIDENTIAL/INSTITUTIONAL LAND USE 1990

considered compatible for residential occupancy under the present railroad line operations. As a result of these noise contours imposing such a low impact on the environment, contour mapping was felt unnecessary and, therefore, no railroad line contours are graphically presented in this report.

Yard Operations

Acoustical analysis of the switching operations near Atlanta Avenue was pursued by means of the methodology outlined in Section 3.4.2 and is given in detail in Reference 13. As mentioned in Reference 13, switchers normally operate along a switching lead as cars are moved about the various branch tracks. In order to realistically analyze the noise environment around a switcher locomotive, a single point location along the switching lead must be chosen which represents the centroid of switcher motion. In practice, only a person experienced with the operations along the switching lead of interest is qualified to assign the location of this centroid point. This center of activity is referred to as the "noise center of concentrated areas of switching."[13]

The position of the noise center along the switching lead near Atlanta Avenue was not known, and a graphical representation of the contours was therefore not included. If a noise center position is assumed, noise contours may be located in the following manner. The noise contour positions calculated are located at a constant radius emanating from the noise center along the switching lead. Noise contours for the switcher operations near Atlanta Avenue encircle the noise center by radii of 200 feet and 120 feet for the L_{dn} 60 and 65 contours, respectively. Because of the variability of switcher locomotive operations and the subjectivity of choosing the position of the noise center, the L_{dn} contour locations designated in this study are only first approximations and as such must be interpreted with reservations.

3.6.3 Aircraft Noise Impact at Meadow Lark Airport

Airport Operations Data

The operating assumptions applied to the computation of CNEL noise contours for Meadow Lark Airport are based solely on information supplied by the Huntington Beach Planning Department and not on any field verification effort.[14, 15]

Annual Operations

- 100,000 local general aviation aircraft
- 10,000 itinerant general aviation

Average Daily Operations

- Approximately 150 takeoffs and 150 landings

Aircraft Mix

- No jet aircraft
- Predominantly single-engine general aviation piston aircraft typified by the Cessna Model 150

Stage Lengths

- All aircraft operate under a 500-mile range

Airport Characteristics

- No evening or nighttime operations
- Single 2,000 foot runway
- 300 foot displaced threshold
- The approach pattern is typically from the northeast and takeoff to the southwest. Figure 3-16 identifies the dominant ground tracks.

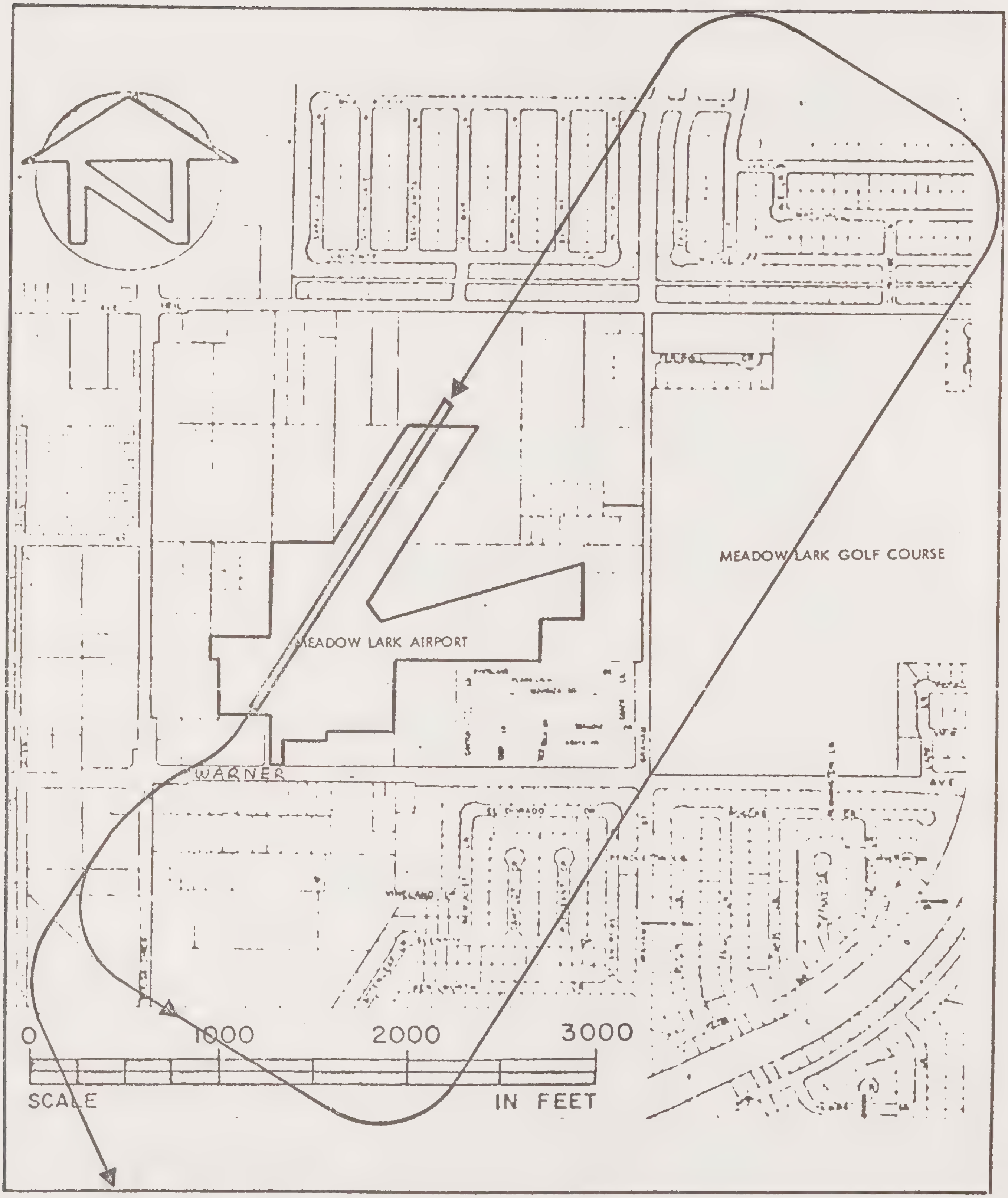
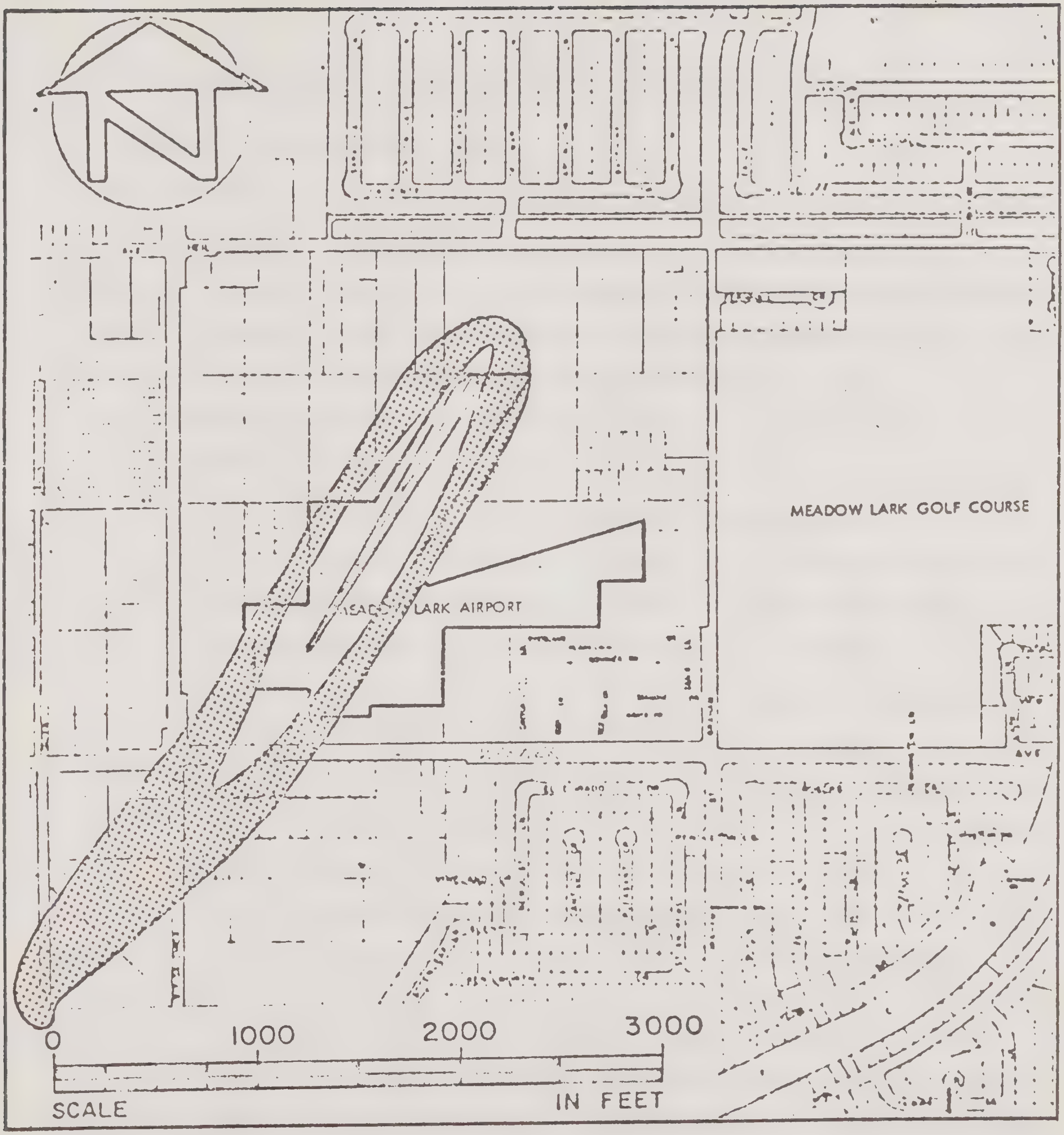


Figure 3-16. Meadow Lark Airport Ground Track Assumptions



- CNEL 60
- CNEL 65
- CNEL 70

Figure 3-17 Meadow Lark Airport CNEL 60, 65, and 70 Noise Contours

Meadow Lark Airport CNEL Noise Contours

Figure 3-17 shows the CNEL 60, 65, and 70 noise contours. For ease of reference, an across-the-board approximation may be made between the CNEL values and L_{dn}. This generalization will normally be accurate within 1 dB. As has been pointed out in previous reports, Meadow Lark Airport is today almost totally surrounded by residential land use resulting from unplanned development.[14] Although the impact area is very small, as defined by the residential area under the CNEL 65 contour, some problems do result because of residential land use immediately adjacent to the main runway and under the southwest takeoff pattern. A short-term goal to alleviate this impact could be to prohibit any new development under the CNEL 65 contour and to require adequate noise insulation for new construction under the CNEL 60 contour. A longer range goal suggests the acquisition of land, land use rezoning and/or noise insulation requirements and subsidies for all existing residential land use under CNEL 65. Although, at present there appears to be no legal impact as defined by the State Noise Regulation, i.e., the CNEL 70 falls inside the airport boundary, the airport may be in violation under the CNEL 65 criteria for residential land which must be met by December 1985. Some relief, however, may be expected over the next 5 to 10 years as noise certification rules for general aviation aircraft, proposed by the FAA, are implemented. (For more information on land use compatibility with noise, see Section 3.6 of this report.)

It should be noted that the evaluation of noise at Meadow Lark Airport was based on a limited amount of available data, including airport boundary information, and is not intended as a precise analysis of the situation. Further, noise contours generally have inherent limitations of accuracy. Noise contours are merely tools; they provide an indication of potential problem areas and should therefore be used only for planning purposes in lieu of more detailed studies and consideration of peculiar social, economic, political, and other local factors.

3,7 Community Noise Survey

Noise Emission in the Community

In order to adequately describe the noise environment of an urban area, an analysis must be performed which will encompass a multitude of potential intruders on the community's peace and quiet. Such an investigation lends itself to highly complex analytical modeling and empirical noise surveys. When gross or average activity of a noise source can be assumed, modeling is typically the most efficient means to make noise assessments for urban areas. Noise emanating from auto and truck traffic, railroad operations, and aircraft operations at Meadow Lark Airport were quantified by analytically calculated noise contours and are presented in the preceding section. Noise sources producing randomly occurring noise intrusion cannot be successfully modeled and must depend on analysis via field measurement. Such a noise measurement program was conducted for Huntington Beach utilizing 50 sites of interest.

The 50 sites were chosen to cover the spectrum of noise source types and classifications of human sensitivity to noise. Acoustical recordings at these sites were then compared with human sensitivity criteria and the degree of noise influction assessed.

Noise propagating into the community can be attenuated by a variety of means, including natural spreading loss of sound waves, air absorption, ground attenuation, wind gradient diffraction of sound waves, shielding by barriers and buildings, and transmission loss as sound penetrates walls and enters buildings. The virtue of a noise survey is that complicated attenuation effects need not be analyzed for each case because measurements simply record the actual levels of noise exposure at the location of interest. The limitation of a noise measurement survey is that measured noise levels are only applicable to each particular measurement site, thus losing the generality needed in an investigation to adequately cover an entire urban area. In any case, the measured values recorded at specific sites do approximate the general noise picture for the local area. Measured levels must, in turn, be interpreted

in their proper perspective to assure that levels are representative of what humans will actually be exposed to and not to noise areas that bear no relevance to actual community noise infliction.

All noise measurements in Huntington Beach were made outdoors. Since the City's residents spend considerable time indoors, some consideration accounting for outdoor to indoor noise transmission will be presented here. In general, the noise transmission loss through a wall is dependent on factors such as mechanical composition of the wall material, density of the wall material, wall thickness, and frequency of the sound wave. Therefore, caution must be used when applying any generalization about wall transmission losses. As a first approximation of predicting the reduction of outdoor to indoor noise, Table 3-9 can be used. Although use of Table 3-9 drastically oversimplifies the real situation, these reduction values are good approximations to aid the establishment of average indoor noise levels in Huntington Beach.

Table 3-9

Sound Level Reduction in A-Weighted Noise Levels Due to Houses in Warm and Cold Climates with Windows Open and Closed (Reference 5)

	Windows Open	Windows Closed
Warm Climate	11 dB	26 dB
Cold Climate	18 dB	28 dB
Approximate National Average	15 dB	27 dB

3.7.1 Noise Measurement Procedure

The primary purpose of the noise survey was to describe the background noise environment and the noise exposure of single event intrusions at each site.

The background noise level is referred to as the residual noise level which is defined as the noise level remaining when all single event noises are excluded. To

be more quantitative, the residual noise level can be defined as the noise level exceeded 90 percent of the time and is correspondingly labeled L_{90}. L_{90} and residual are only qualitatively synonymous. Precise measurement of L_{90} levels require magnetic tape recordings and computer-assisted data reduction. Such an elaborate procedure was not warranted in this analysis, and a simplified approximation method was used to assign residual levels at the Huntington Beach measurement sites. This simplified method required only the use of a sound level meter to achieve approximate residual levels. For each residual level reading at a site, the sound level meter was read with the "slow" time response and the meter needle observed during intervals of time in which no single identifiable noise events occurred. The noise level which was considered typical of the lowest readings on the sound level meter was designated to approximate the residual level.

Single event noise intrusions were also observed and peak readings on the sound level meter using slow time response were recorded. Measurement sites near arterials and highways were exposed to frequent single event intrusions. For these sites, several dozen automobile and truck passbys were allowed to occur while the meter needle was observed. A range of typical passby levels was established and recorded.

All sound level meter readings were measured by a Bruel & Kjaer Model 2205 sound level meter. Field calibrations of the sound level meter were periodically made to assure correct readings. A summary of noise level data collected for each site is located in Appendix E. Discussion of residual levels and single event noise intrusions observed in Huntington Beach follow.

3.7.2 Summary of Residual Noise Levels

The residual noise level was defined in the previous section as the level remaining when all single event noise intrusions are excluded. Analysis of Huntington Beach residual noise levels was subdivided into daytime and nighttime periods to account for the differences in human sensitivity during active and resting time intervals over a 24-hour day. Table 6-2 may be used to quantify daytime residual levels in

terms of residential area noise descriptor classifications.[6] Nighttime residual noise levels in this study are compared with the criteria levels given in Reference 18 for acceptable sleeping quarters noise environments. These criteria levels are implied for interior noise levels to which the resident would be exposed during sleeping hours. Recommended requirements of the interior (A-weighted) nighttime levels are that they:

> ". . . do not exceed 55 dB for more than an accumulation of 60 minutes in any 24-hour period,
>
> . . . do not exceed 45 dB for more than 30 minutes during nighttime sleeping hours from 11:00 p.m. to 7:00 a.m., and
>
> . . . do not exceed 45 dB for more than an accumulation of 8 hours in any 24-hour day."

Table 3-10

Qualitative Descriptors of Urban and Suburban Detached Housing Residential Areas and Approximate Daytime Residual Noise Level (Reference 6)

Description	A-Weighted Daytime Residual Noise Level in dB	
	Typical Range	Average
Quiet Suburban Residential	36 to 40 Inclusive	38
Normal Suburban Residential	41 to 45 Inclusive	43
Urban Residential	46 to 50 Inclusive	48
Noisy Urban Residential	51 to 55 Inclusive	53
Very Noisy Urban Residential	56 to 60 Inclusive	58

Table 3-9, mentioned earlier, describes an approximate relation between outdoor and indoor noise levels. If an interior residual noise level of 45 dB assigned, and wall transmission loss values for warm climate structures are chosen, exterior residual criteria levels may be assumed as 56 dB for windows open and 71 dB for windows closed to achieve "acceptable" levels for sleeping quarters.

Residual noise levels for each site are given on the data sheets in Appendix F. Figures 3-9 and 3-10 depict measurement site locations in Huntington Beach for daytime and nighttime noise readings respectively and indicate the magnitude of residual noise levels recorded at each of these sites. Using the criteria in Table 3-10, daytime residual levels registered a community noise classification range from "Normal Suburban Residential" to "Very Noisy Urban Residential" inclusive. It must be noted that a number of the microphones were located adjacent to very noisy operations such as intersections in commercial areas, and these sites should not be considered typical of residential environments. Generally, residential measurement sites revealed daytime levels classified as "Urban Residential" and "Noisy Urban Residential." All nighttime exterior residual levels registered below the 71 dB criteria established in the previous paragraph for closed windows, and all but the residential site adjacent to the Southern California Edison Company power plant on Newland Street were well below the 56 dB criteria for open windows. Therefore, status quo residual levels at nighttime may be maintained in general, and acceptable residual noise conditions for sleep will be secured. It is recommended, though, that for homes near the power plant, windows on the exposed side of the house be closed for a most restful sleep.

3.7.3 Summary of Single Event Noise Intrusions

A list of peak noise levels emitted by single events observed at the 50 sites in Huntington Beach is presented in Table 3-11. This table clearly indicates the highest noise exposures in Huntington Beach were attributable to trucks on arterials. The types of sources in the City that produced the lowest noise levels were typically found in residential areas away from arterials, residential areas near arterials but with barrier walls, and in school areas.

The noise levels listed in Table 3-11 may be compared to annoyance criteria for the peak levels of single event noise intrusions given in Figure 3-11.[19] Generally, the single event intrusions observed in Huntington Beach fell within the "acceptable" noise criteria levels.

Figure 3-18. Measurement Site Locations and Community Noise Ratings of DAYTIME A-Weighted Residual Noise Levels

Figure 3-19. Measurement Site Locations and Community Noise Ratings of NIGHTTIME A-Weighted Residual Noise Levels

Table 3-11

Maximum A-Weighted Noise Levels of Single Event Intrusive Noise Sources Observed in Huntington Beach

Noise Source	Type of Urban Area	Level dB
Truck	Boat Dock (Adjacent Highway)	85
Truck Acceleration	Commercial (Adjacent Arterial)	82
Motorcycle	Residential (Adjacent Collector Street)	82
Truck Acceleration	Commercial	81
Sports Car Acceleration	Commercial (Adjacent Arterial)	80
Truck Passby	Residential (Adjacent Arterial)	80
Police Motorcycle	Residential (Adjacent Arterial)	80
Truck Passby	Residential (Adjacent Arterial)	79
Truck	Commercial	78
Truck Acceleration	Residential (Adjacent Arterial)	78
Miscellaneous Traffic	Commercial (Adjacent Arterial)	78
School Bus	Residential (Adjacent Arterial)	78
Miscellaneous Traffic	Boat Dock (Adjacent Highway)	78
Sports Car	Residential (Adjacent Arterial)	76
Public Address System	Public Beach	76
Truck Acceleration	Park (Adjacent Arterial)	74
Miscellaneous Traffic	Residential (Adjacent Arterial)	75
Miscellaneous Traffic	Commercial (Adjacent Arterial)	75
Miscellaneous Traffic	Commercial (Adjacent Arterial)	75
Garbage Compactor Shovel	Industrial	75
Motorcycle	Park (Adjacent Arterial)	74
Miscellaneous Traffic	Commercial (Adjacent Arterial)	74
G.A. Aircraft Takeoff	Commercial	74
Truck	Park (Adjacent Arterial)	73
Miscellaneous Traffic	Residential (Adjacent Arterial)	72
Automobile Passbys	Commercial (Parking Lot)	72
Truck Passby	Residential (Vicinity of Arterial)	70
Miscellaneous Traffic	Recreational (Adjacent Highway)	71
Miscellaneous Traffic	Residential (Adjacent Arterial)	69
Helicopter Flyover(500 ft. from mike)	Industrial	69
Miscellaneous Traffic	Commercial	68
Truck	Residential (Vicinity of Freeway)	60
Miscellaneous Traffic	Residential (Adjacent Arterial)	68
Surf Breaking	Public Beach	68
Oil Pump (30 ft. from mike)	Oil Pumping Locality	68
Miscellaneous Traffic	Residential (Vicinity of Arterial)	66
Traffic on Collector Street	Hospital (Parking Lot)	66
Miscellaneous Traffic	Park (Adjacent Arterial)	66

Table 3-11 (Continued)

Noise Source	Type of Urban Area	Level dB
Local Jet Aircraft	Residential	65
Truck on Arterial	Commercial (Parking Lot)	64
Miscellaneous	Commercial (Parking Lot)	64
Construction Diesel	Industrial	63
Local Traffic	Agricultural Property	63
Dog Barking	Residential	62
Jet Aircraft	Commercial	62
Miscellaneous Traffic	Residential (Adjacent Collector Street)	62
Miscellaneous Traffic	Residential (Adjacent Arterial)	62
Single Car Passby	School Yard (Adjacent Arterial)	61
Miscellaneous Traffic	Park (Adjacent Arterial)	60
Helicopter Flyover	Park (Adjacent Arterial)	60
Miscellaneous Traffic	Residential (Vicinity of Freeway)	60
Powered Edger	Residential	60
Hammering by Resident	Residential	60 +
Bus	Residential (Vicinity of Arterial)	59
Truck	Residential (Adjacent Arterial with Barrier Wall	58
Truck	School (Vicinity of Arterial)	58
Distant Small Aircraft	Residential	58
Car in Parking Lot	Hospital (Parking Lot)	58
Aircraft	Industrial	58
Mechanical Equipment	Residential (Adjacent Industrial)	57
Miscellaneous Traffic	Residential (Adjacent Arterial with Barrier Wall	56
Public Address System at Car Agency	Residential (Adjacent Commercial)	56
Distant Jet Aircraft	School (in Residential Area)	50
Power Plant	Mobile Home Park	56
Large Boat	Residential (Adjacent Harbor)	54
Miscellaneous Traffic	Residential (Adjacent Arterial with Barrier Wall)	54
Music on Public Address System	Commercial (Parking Lot)	54
Barking Dog	School (in Residential Area)	54
Distant Jet Aircraft	Residential	53
Compressed Air Being Released	Residential	52
Miscellaneous Traffic in Vicinity	Residential	52
Truck	Park (Shielded from Arterial)	50
Distant Jet Aircraft	School (in Residential Area)	50

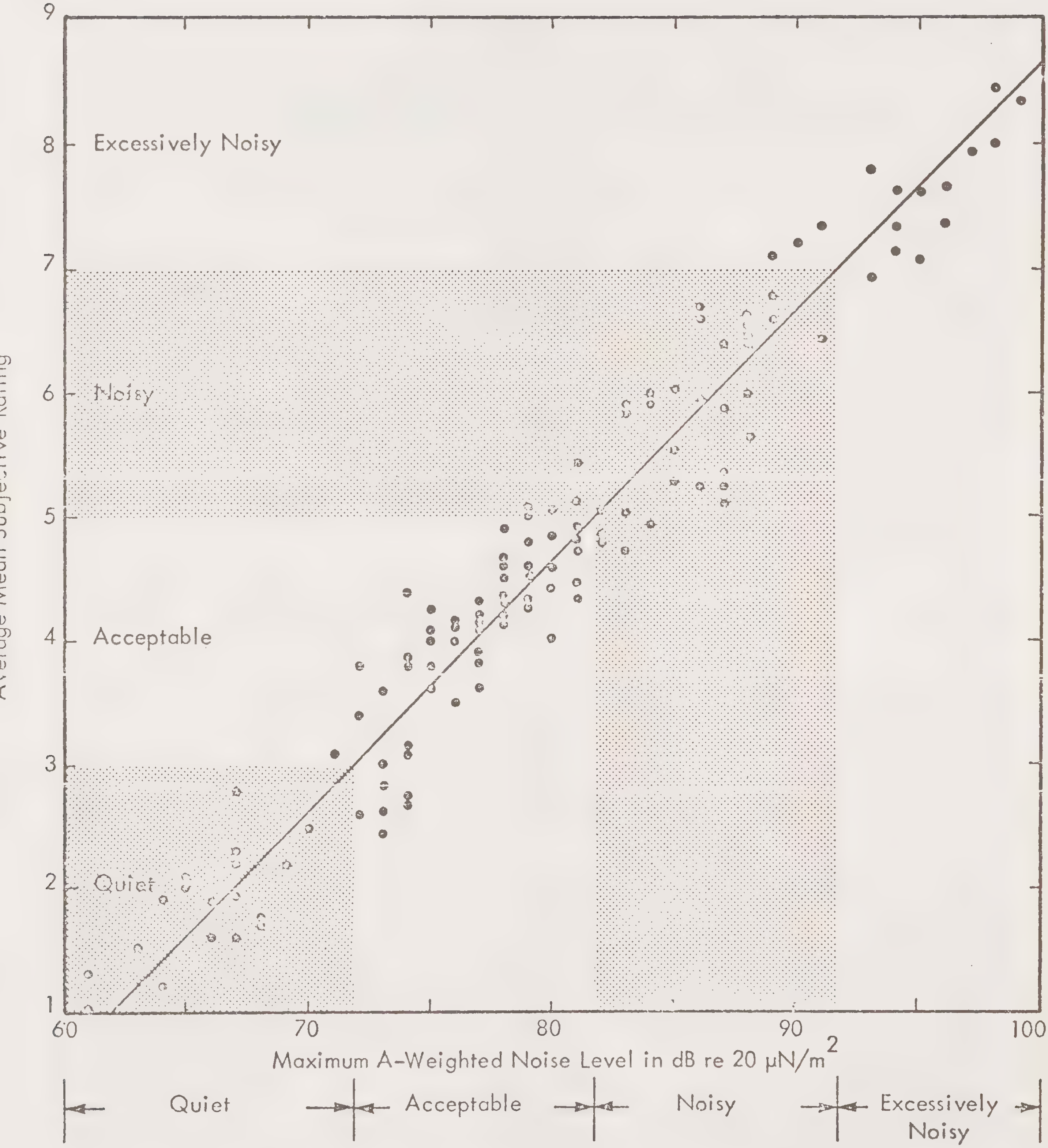


Figure 3-20. Average Mean Subjective Rating as a Function of Maximum Noise Level in dB for the British Experiment at the Motor Industry Research Association Proving Grounds. Nineteen Vehicles, Including Trucks, Automobiles, and Motorcycles were Judged Twice in Each of Three Different Operating Modes by 57 Observers.[19]

Another consideration of the intrusiveness of Single Event Noise Exposure relates to conversational interruption by extraneous noises. The relationship between the distances separating people to achieve intelligible conversation and the ambient noise level is described in Figure 3-21. For instance, two people would have to be within 2 feet of one another to maintain intelligible conversation at a normal voice level if the ambient noise level was more or less constant at 70 dB. The noise levels of single events in Huntington Beach varied vastly and generalizations about the City's conversational intellibility status were difficult to assess. For most cases, though, conversational intellibility was not found to be a problem except possibly very near major noise sources such as freeways or arterials.

3.7.4 Usefulness of the Noise Survey

The noise survey for Huntington Beach provided a description of the residual noise level and typical levels emitted by single event-type noise sources for 50 locations throughout the City. The noise levels recorded in Huntington Beach should only be interpreted as approximations to the City's noise exposure when taking into account the fact that each site was visited only for a short time interval, and variations in the noise environment over the time domain are not uncommon in urban areas.

The residual level is limited in its applicability to a community noise rating scale because the scale is independent of intrusive single event-type noises that are disruptive to a community. Conversely, placing annoyance criteria solely on a maximum ceiling noise level that is not to be exceeded, in hopes of achieving an acceptable community noise environment, will not necessarily be the most feasible approach because people can be subjected to a limited number of disturbing noise events, yet coexist in a generally peaceful and quiet community. Ideally, measurements should reflect the total noise exposure at a site over the 24-hour day. Such measurements require continuous monitoring over long time periods, and procedures of this nature were far beyond the scope of this investigation. The analytically predicted L_{dn} transportation

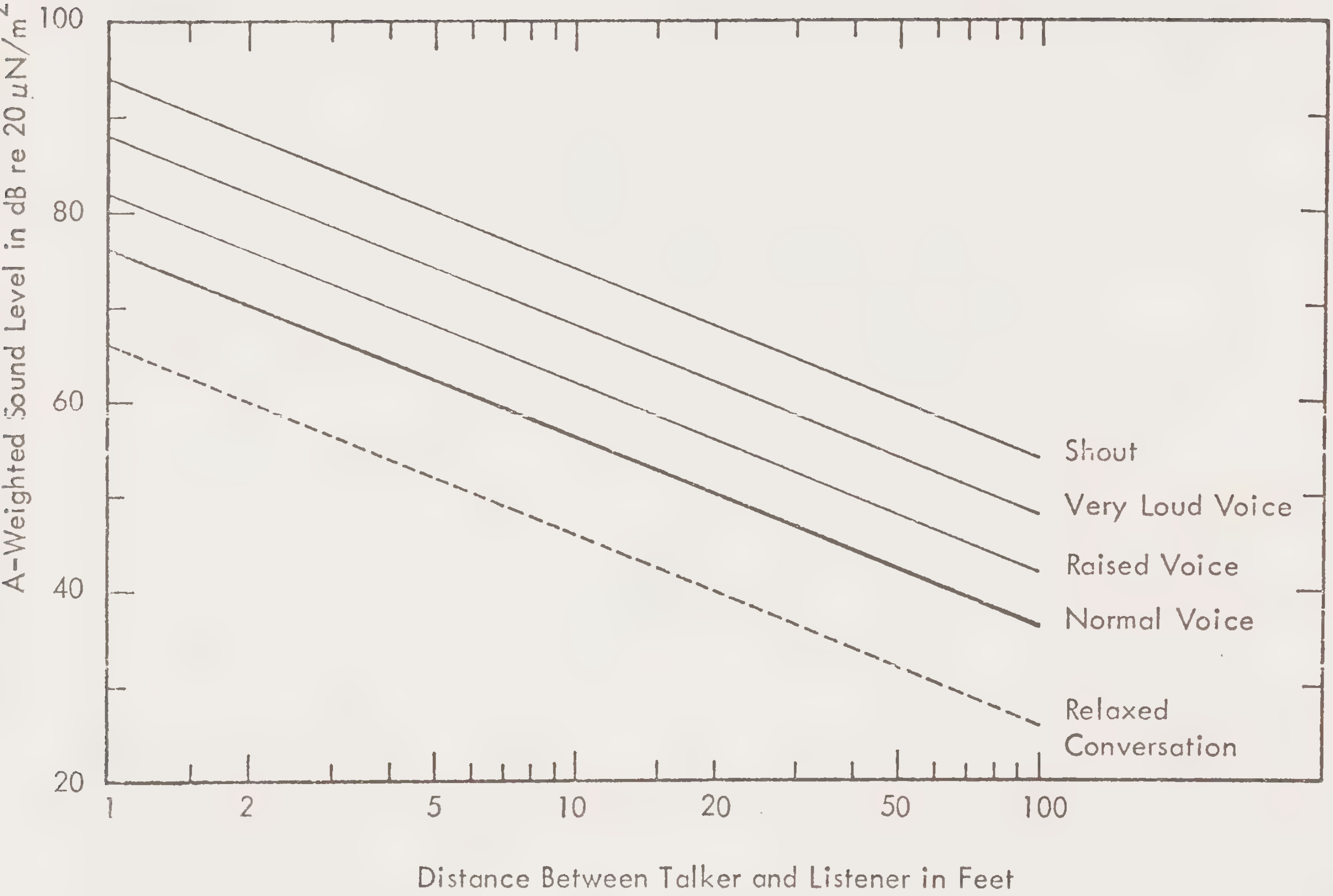


Figure 3-21. Maximum Distance Between Talker and Listener for Just Intelligible Conversation and for Highly Intelligible Relaxed Conversation as a Function of Noise Level[20, 21]

noise contours developed in this report quantify noise exposure in terms of peak noise level of discrete events, duration of events, number of occurrences, and weights nighttime noise intrusions as more annoying than daytime levels. These L_{dn} noise contours serve as a highly useful means in accurately describing the composite noise environment. In addition to using the L_{dn} contours, the results of the noise survey also present useful descriptors of noise, but are limited in scope when integrating the entire noise picture over the 24-hour day.

3.8 Special Noise Sources and Mitigation Measures

The following section discusses three subject areas of particular concern and interest to the City. These are:

- Noise from police helicopter operations
- Noise from oil well pumps
- Barrier walls effectiveness

3.8.1 Police Helicopter Operations

Police helicopter surveillance procedures in Huntington Beach were considered a potential annoyance to the City's tranquility. Wyle's approach to investigating the noise emission from the helicopters was to empirically analyze noise exposure via standard field measurement techniques. The field study results were then compared to the best available annoyance criteria and recommendations established.

The standard helipads are located at the Civic Center and on Gothard Street. From these helipads, surveillance operations throughout the City transpire over nearly the entire 24-hour day. Helicopters typically cruise at 60 miles per hour at an elevation between 750 and 1000 feet. The hover mode of operation over residential areas is not a standard procedure, and is kept to a minimum – employed only when necessary.

The major components of helicopter noise are the combined effects of engine and rotor. Helicopter engine noise levels can be related to human annoyance in the

classical sense of A-weighted noise level versus human response. Rotor blade noise disturbs people in a different way than engine noise due to the phenomenon of blade slap. These pulsations induce added stress on the human nervous system over what is normally expected at the observed A-weighted noise level. Blade slap is perceived by the ear as a low frequency pure tone composed of impulses. It is clearly known that both pure tone noises and impulsive noises are rated by humans as more annoying than typical noise sources in the community which emit the same A-weighted noise level. The combined effect of low frequency pure tonal noise with impulsive wave fronts upon the human nervous system has not been adequately quantified. Therefore, the annoyance criteria used in the recommendations presented in this section should be interpreted with reservations until human reaction to helicopter noise is better defined.

A series of noise measurements were conducted for typical flybys of a Hughes 300B helicopter (the model used by the Huntington Beach Police Department). Each flyby noise exposure was recorded on magnetic tape which enables analysis of the sound pressure level time history and a definition of the cumulative acoustical noise energy versus distance to the helicopter. It was observed that the cumulative acoustical energy of helicopter passbys for a typical number of operations revealed L_{dn} levels significantly lower than was to be expected.

In order to realistically assess annoyance criteria relative to actual operations, the recommendations here will focus only on the most sensitive noise issue of nighttime disturbance. During human sleep, noises can bring a person to a mere shallow state of sleep or even to complete wakening. A single exposure to a noise that awakens a sleeping person has a far-reaching detrimental effect on that person's ability to receive a healthy period of rest. Present data relating noise levels and levels of sleep is somewhat limited and inconclusive. A study dealing with truck noise effects on sleep found (via changes in electronically-recorded brain waves) that for human exposure to levels of 40 to 45 dB, 10 percent of the subjects either shifted to a more shallow state of sleep or awakened, and for levels of 50 dB, 50 percent either shifted to a more shallow state or awakened.[22]

For purposes of establishing a first approximation of the most appropriate annoyance criteria, a conservative noise level of 45 dB for direct exposure to the sleeping area has been assumed as the level not to be exceeded. Typical reduction levels of helicopter noise transmitted through walls have not been evaluated, but are estimated to be slightly less than for automobiles, since helicopter noise spectra have a higher concentration of acoustical energy in the low frequencies. Appropriate transmission loss values have been assigned 10 dB for windows open and 20 dB for windows closed. Thus, exterior helicopter levels should not exceed 55 dB and 65 dB for windows open and closed, respectively.

Comparing the criteria levels with an A-weighted noise level versus slant range relation based on Wyle Research field data (see Table 3-12), helicopters must fly at an elevation of at least 700 feet to keep the noise level on the ground below 65 dB and at least 2000 feet to keep the noise level below 55 dB. A 2000-foot altitude, however, may be too high for effective surveillance procedures.

Table 3-12

Average Maximum A-Weighted Noise Levels for Typical Helicopter Flyovers at Various Slant Ranges

Noise Level (dBA)	Slant Range (Feet)
68	500
64	800
62	1100
60	1300

There is no clear-cut evidence which suggests that random flight patterns may be better or worse than regular schedules and strictly-defined flight patterns. Some individual will be startled by the unexpected occurrence of an overflight, but may be more accepting when routine anticipated flights take place. Others, however, will exhibit just the reverse reaction. The following is therefore recommended:

- Mufflers
- Keep operations as high as possible.
- Takeoff and approach should be near vertical.
- Keep routine operations as far from noise-sensitive areas as possible.
- Operate without "blade slap" over noise-sensitive areas.
- Regularly apprise the community of the benefits of police helicopter operations in furthering the cause of crime prevention.
- Criteria for Establishing Heliports:
  - Avoid residential areas and other noise-sensitive areas in planning routes, approaches, and takeoffs.
  - Adhere to maximum of 65 L_{dn} at property lines of residential areas or intensive uses.
  - Locate heliports where adjacent spaces will not trap sound and re-echo it. The more open the surrounding area, the more quickly the noise dissipates.

3.8.2 Oil Pump Noise Analysis

Definition of the Potential Problem

Numerous oil pumping operations presently exist in Huntington Beach. There is a large diversity in the number and types of pumps at any one location, and the spatial distribution of these pumps varies from site to site. As a result, many pumps are found in the vicinity of residential dwellings. The environmental impact of oil pumping stations is threefold: (1) noise from the power unit and miscellaneous mechanical noise sources, (2) air contamination from any chemical leakage, and (3) aesthetic degradation of the local landscape. Although any or all of these three aspects may adversely affect an area, only noise considerations will be dealt with in this analysis. It should, however, be noted that the combined impact of effects is often greater than the impact from any one of the component parts.

A thorough identification of all oil operations that intrude upon the noise environment in Huntington Beach is far beyond the scope of this study. The approach taken in this analysis was to quantify the noise emission from discrete oil operations on a generalized basis and then identifying more obvious potential offenders. The one area with pronounced usage of oil drilling and pumping operations was along the Burma Oil Strip. This operation will be considered as part of the analysis to follow.

Existing Noise Emissions from Pumps

The three types of oil well pumps in Huntington Beach are: (1) ball and plunger, (2) hydraulic pump, and (3) submersible pump. Of these three types of oil pumps, only the ball and plunger was considered potentially annoying to the local noise environment. The ball and plunger pump is powered by either an electric motor or a gasoline engine.

Field measurement analysis, similar to the procedure recommended in Appendix D, was conducted for both electric motor- and gasoline engine-powered ball and plunger oil pumps. "A-weighted" noise levels measured by Wyle Research are given in Table 3-13.

Table 3-13

A-Weighted Noise Levels Emitted by Ball and Plunger Oil Well Pumps

For Gasoline Engine (dB)	For Electric Motor (dB)	Distance to Power Unit (Feet)
74	62	15
68	56	30
62	50	60
55	Below Residual Noise Level	120

Noise Survey Sampling Near Oil Operations

Five sites were selected to represent what was felt to be the entire range of noise impact from oil operations in Huntington Beach, identified in Figure 3-22. Raw data from each of these sites are found on data sheets in Appendix F. Collection of data was made in accordance with the methods in Section 3.7.1. From these data, very crude estimates of L_{dn} values were made for each site, assuming the residual level was equal to the average acoustical energy level over the 24-hour day. This information allowed approximations of the noise impact on the environment to be assessed for the various locations. In reality, the residual level will most likely decrease during nighttime hours. Thus, the L_{dn} values used in this analysis will reflect more conservative levels than actually exist.

The noise environment assessment criteria given in Figure 3-12 is utilized also in this application. The various sites observed revealed noise environment ratings of "clearly acceptable" to "clearly unacceptable." Two of the sites were residential areas (sites B and D) in the vicinity of the Burma Oil Strip, in which little or no barrier shielding blocked the line-of-sight to the oil strip. Both of these sites displayed a "normally unacceptable" criteria level based on measurements made in the afternoon while drilling operations were being conducted. Complete curtailment of drilling during nighttime hours would decrease L_{dn} levels below the estimated levels given here. An acceptable noise environment may possibly be reached by reducing night drilling operations and requring the number of loud single occurring events (such as compressed air bleeding) during all operating hours to be kept to a minimum.

Site E indicated a "clearly acceptable" noise environment existed. Although this site was in close proximity of site D (site D was shown "normally unacceptable"), compatible noise levels were registered at site E due to the shielding effects of houses between the microphone and the Burma Oil Strip. Loud pulsations of compressed air bleeding were observed but were not included in the approximation of the L_{dn} at site E. If continous 24-hour recordings of the noise were made at site E, this more precise

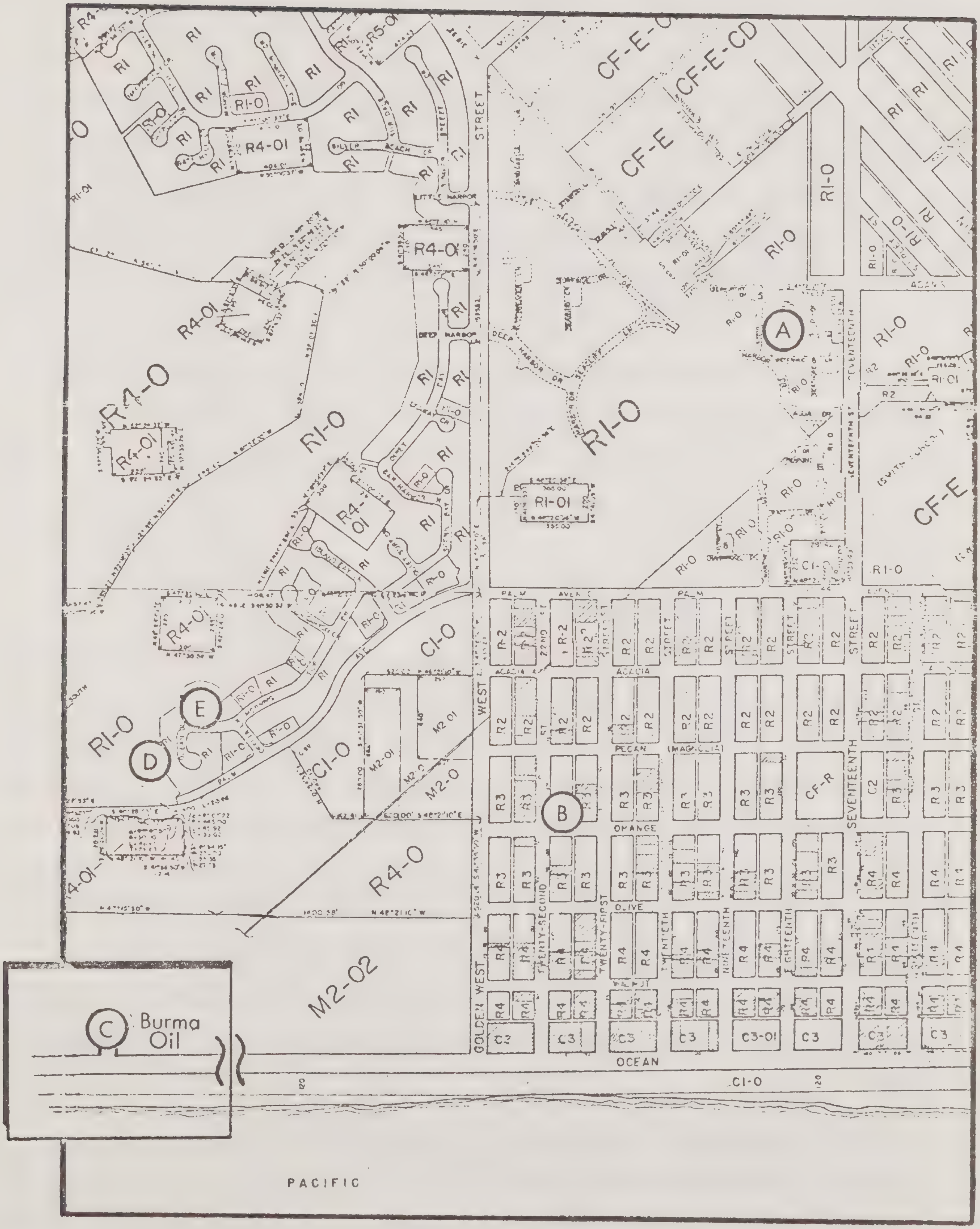


Figure 3-22. Oil Well Measurement Site Locations

measurement method might show a noise environment actually incompatible simply due to the compressed air being released.

Site A was also considered "clearly acceptable" at the measurement locations on residential property adjacent the Standard Oil "L" Island. This section of oil property was bounded by a wall approximately 6 feet high which appeared to attenuate the noise by nearly 10 dB measured 4 to 5 feet above the ground. Measurements could not be taken at the second floor level of buildings which had direct line-of-sight exposure to the oil pumps.

Measurements were taken at the entrance to the Burma Oil Stip (Site C) to establish maximum property line noise levels. Approximate L_{dn} levels here were rated as "clearly unacceptable" for human living. Since residential areas do not exist along Pacific Coast Highway near the property entrance, no housing areas were impacted by noise.

Oil Pump Noise Environment Improvement

Based on the noise measurements of discrete oil pumps discussed in Section 6.3.2, recommended minimum distance to housing structures will be provided using a criteria of the L_{dn} level no greater than 60 dB. Using the methodology in Appendix D to calculate L_{dn}, it is recommended that new residential development should not be allowed within 150 feet of a gasoline engine-powered pump and 50 feet of one driven by an electric motor. These sphere-of-influence distances must only be considered approximate because slight variations in the noise level occur between oil pumps of the same type. Also, miscellaneous mechanical noises such as from the play being suddenly removed in the counterweight crank mechanism contribute to added annoyance. Such special cases cannot be readily predicted and must be dealt with on an individual basis.

Areas presently influcted by noise from oil operations may improve compatibility by the following alternatives:

Mitigating Measures

1. Reduce operating hours, especially drilling operations, during nighttime hours. This may be impractical and will depend on the type of operation.

2. Build enclosures or construct barriers to shield sound emitted by pumps. For single-story dwellings in the vicinity of electric-powered oil pumps, a 6-foot barrier wall appears to be adequate in height provided the wall is located either close to the pump or to the housing structure. The specification for barrier wall height for dwellings with two or more floors cannot be assessed easily for the general case.

3. Install better mufflers on gasoline-powered oil pumps.

4. Maintain regular maintenance schedules on equipment to eliminate added noise that accommodates wear and tear of bearings, cylinders, etc.

5. Construct portable barrier walls that will shield noise from temporary drilling sites.

6. Replace gasoline-powered pumps with one of the quieter types.

3.8.3 Effectiveness of Barrier Walls Along Arterials

A large number of arterials in Huntington Beach are bounded by walls which shield homes from direct exposure to traffic. In general, these walls are effective in reducing propagation of annoying levels into the community in addition to providing a more aesthetically pleasing environment for homeowners.

Field measurements were performed to assess the degree of noise reduction provided by a typical wall configuration in the City. The nominal barrier wall attenuation was observed to be approximately 10 dB for automobiles. This data was

compared with a barrier analysis procedure in the literature.[12] The predicted attenuation was within 1 dB of the mean barrier attenuation measured in Huntington Beach.

Over the time period of barrier field noise measurements, very few heavy truck passbys occurred. The few attenuation values which were recorded demonstrated no consistent reduction in truck noise due to the wall. The primary reason truck levels did not correlate well was that the components of a truck which generate noise are located high above the ground and the truck's position with respect to a relatively low wall (typically 6 feet in Huntington Beach) is critical when ascertaining noise reduction. Generally, truck noise levels were not reduced significantly by present walls in Huntington Beach. In order to retain a slight degree of conservatism, the barrier walls were assumed to contribute no attenuation to truck noise levels.

A nomogram procedure was devised which enables the position of the L_{dn} 60 and 65 dB contours to be determined for a typical arterial in Huntington Beach with a nominal 6 foot high wall located approximately 15 feet from the center of the outside lane. The only input parameter needed is the Average Daily Traffic (ADT) flow on the arterial. The ADT can be entered in the horizontal scale of Figure 3-23, and the distance from the center of the outside lane to the L_{dn} 60 and 65 dB contours can be directly read off the left and right hand vertical scales for conditions of inclusion of wall and no wall respectively. The difference between the contour positions with and without the wall can be used to determine the effectiveness of wall utilization. It should be noted that from Figure 3-23, the L_{dn} noise contours are shifted closer to the road as ADT increases when a wall is added to an arterial. Therefore, the wall's effectiveness on land compatibility becomes more significant as ADT is increased.

It must be realized that barrier walls become somewhat ineffective as the observer is elevated above the wall. As a result, dwellings above the first floor see little or no effect of a nominal 6 foot high wall. This is important since in many cases the sleeping quarters (the most noise-sensitive part of a house) of two-story residential

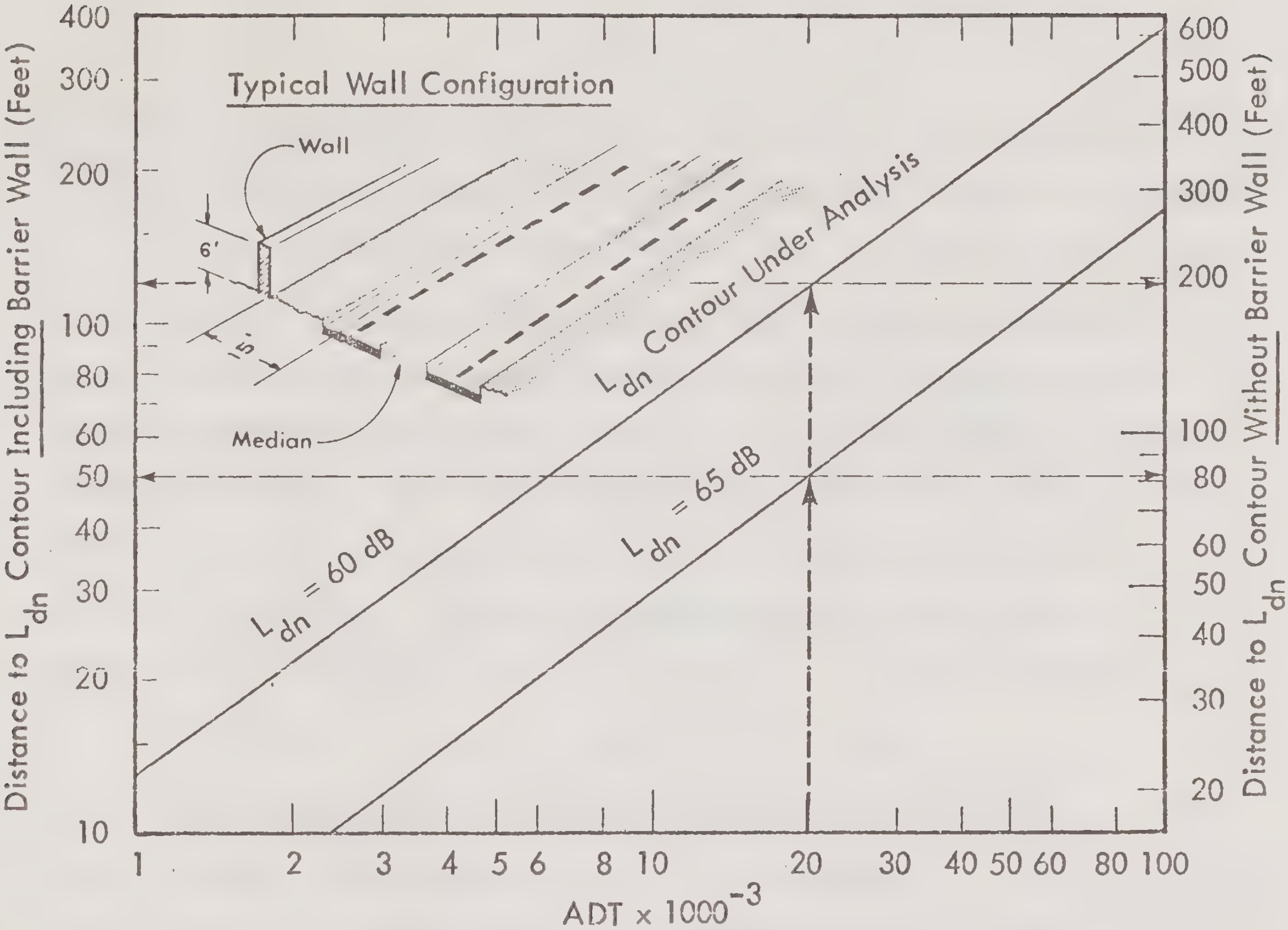


Figure 3-23. Barrier Effectiveness Nomogram. Nominal Parameter Values for Huntington Beach Arterials have been Assumed as Four Lanes, 3.9 % Trucks, 14 foot Median, 35 mph, 87 % of Traffic Flow During Daytime and 13 % of Traffic Flow at Night.

Example

Known: ADT = 20,000

Find: Distance to L_{dn} 60 and 65 contours with and without barrier wall and distance the contour is shifted toward the road when the barrier wall is implemented.

Via Nomogram:

(1) Without barrier wall
Distance to L_{dn} 60 contour = 195 feet
Distance to L_{dn} 65 contour = 82 feet

(2) Including barrier wall
Distance to L_{dn} 60 contour = 120 feet
Distance to L_{dn} 65 contour = 50 feet

(3) Distance the contour is shifted toward the road
for L_{dn} 60 contour, shift = 195 - 120 = 75 feet
for L_{dn} 65 contour, shift = 82 - 50 = 32 feet

structures are located on the second level. If future building of higher walls should be implemented, the major consideration in designing a barrier of at least minimal effectiveness is to shield the line of sight between arterial and building structure.

Another improvement in the present barrier designs deals with walls that have open space segments to allow people passage through the wall. When a vehicle passes such an opening, the observer on the opposite side of the wall is temporarily exposed to a noise level the same as if the wall were not there. Rather than simply closing the opening, a short segment of wall can be placed 2 to 3 feet from the present wall on the residential side in parallel with the main wall. The 2 to 3 foot separation will allow pedestrian passage, yet reduce vehicle noise levels into the residential area.

3.9 Jurisdictional Responsibility in Noise Control

As federal, state, and local governments become more responsive to environmental noise problems, confustion arises when different jurisdictions attempt to regulate the same sources of noise. In the Noise Control Act (NCA) of 1972, Congress recognized that while the primary responsibility for control of noise rests with state and local governments, federal action is essential to deal with major noise sources in commerce which require national uniformity of treatment.

The Constitution vests in Congress the right to regulate interstate and foreign commerce, and thus the authority to regulate the noise associated with such commerce. The NCA provides for the establishment of federal noise emission standards for new products and requires that the noise emission and/or reduction characteristics of such products be printed on the new product labels. The Act also authorizes the Environmental Protection Agency (EPA) to establish noise emission standards for motor carriers engaged in interstate commerce, and to recommend regulations to the Federal Aviation Administration (FAA) which the EPA feels are necessary to regulate aircraft noise as well as coordinate federal research activity in noise control. State and local governments are prohibited from setting noise emission levels different from those promulgated by EPA for noise sources covered in the NCA. However, EPA is authorized to assist

local and state governments in the development and enforcement of noise standards to regulate the use, operation, or movement of products and other noise sources whose control is not preempted by federal regulations.

In California, the legislature has taken the initiative in both aircraft and motor vehicle noise control. The State adopted the nation's first state aircraft noise abatement law as well as the first acoustical standards limiting truck, automobile, and motorcycle noise. Table 3-14 is a summary analysis of jurisdictional responsibility in noise control.

3.10 Potential Actions for Reduction of Transportation Noise and Criteria Levels

Introduction

The control of ground transportation related noise impact may be approached in three dimensions; these being source definition, noise abatement measure definition and consideration of potential means of implementation and regulation of the noise abatement policies. Figure 3-24 presents an overview of these dimensions as applied to the major sources of external environmental noise. Our considerations here include ground transportation systems, aircraft, industrial/stationary sources and construction noise. Figure 3-24 lends an overall perspective to the control of environmental noise. This figure also includes consideration of physical source modifications to reduce noise output; however, regulations governing such abatement measures are generally beyond the control of local jurisdictions. The discussions which follow are primarily oriented toward modified operational procedures which serve to minimize the noise emitted by the "traffic stream." Also considered are adjustments to the path of noise travel between source and receiver and finally, modifications at the receiver locations themselves to reduce noise exposure. It is essential in consideration of implementation of potential noise reduction measures that a cost tradeoff study accompany the engineering calculations in order that the most economical combination of measures be incorporated.

Table 3-14

Summary Analysis of Jurisdictional Responsibility in Noise Control

	Aircraft	Motor Vehicle	Noise In General
FEDERAL	- NCA 1972, EPA to propose noise control regulations for aircraft, amends S611 FAA Act of 1958, asserts that FAA and EPA preempt local control (U.S.C. 1973).	- Federal Aid Highways Act, P.L. 91-605 directs Secretary of Transportation to make standards for highway noise control; promulgated in PPM 90-2 of February 1973 - NCA 1972, regulates noise from surface carriers and motor vehicles engaged in interstate commerce.	- Walsh Healy Act applies noise standards to federal contracts. - OSHA applies noise standards to businesses affecting interstate commerce. - NCA 1972 gives EPA authority to prescribe standards for new products: + construction equipment + transportation equipment + any motor or engine + electric/electronic equipment label noise emitting or noise abating equipment.
STATE (California)	- Subchapter 6. Noise standards, Department of Aeronautics. Regulate noise for all aircraft operations to the extent not already limited by federal law.	- Motor Vehicle Code regulates noise limits for new vehicles and all motor vehicle operation. - California Streets and Highways Code S 216 regulates noise within schools near freeways. - Harbor and Navigation Code S2:654.05 regulates noise emission from motorboats in or upon inland waters.	- Division of Industrial Safety publishes noise regulations. - S415 Penal Code prohibits loud and unusual noise that disturbs the peace. - Environmental Quality Act encourages local agencies to control environmental quality.
LOCAL	- Airport authority as proprietor may impose curfew. (Issue has yet to be resolved in courts.)	- Local jurisdiction may enact regulations for off-highway motor vehicles, refuse vehicles and sound trucks. - May regulate the use of roads and highways based on noise considerations.	- May enact ordinances to control: + construction noise + amplified sound + fixed noise sources + loud/unusual noise + other noise sources whose control is not preempted by state or federal government.

NOISE SOURCE IDENTIFICATION	GENERAL ABATEMENT MEASURE CATEGORIES							IMPLEMENTATION/REGULATION PROCEDURE					
	Noise Source Modifications				Path Modifications								
	Individual Source Modifications		"Stream" or Composite Source Modifications										
	Physical Design Changes	Change Operational Procedures	Change Operational Procedures	Travel-Way Redesign	Rerouting Traffic Stream – Increase Path Distance –	Intermediate Barriers	Receiver Treatment – Dwelling Sound Insulation Improvement	Noise Certification Limits on Individual Sources	Operational Limits on Individual Sources – Use Law Restrictions	"Stream" or Fleet Noise Limits	Requirements for Zoning Compatibility	Restrict Operations Within Zones	Noise Tax
Aircraft	●	●	●		●		●	●	●	●	●	●	●
Highway Traffic	●	●	●	●	●	●	●	●	●	●	●	●	●
Railroad/ Rapid Transit	●	●	●	●	●	●	●	●	●	●	●	●	●
Industrial/ Stationary	●	●				●	●	●	●		●		●
Construction *	●	●				●	●	●	●		●		●

Figure 3-24. Potential Application and Implementation of Noise Abatement Measures to Major Sources of Environmental Noise

3.10.1 Highway Traffic Noise

Highway traffic noise has been reported in many studies to be the most pervasive form of environmental noise. It has been shown in a recent study that the day/night average levels (L_{dn}) in urban residential areas which are not near airports or freeways are apparently controlled by motor vehicle traffic noise which, in turn, appears to be directly related to the local population density. These recent findings seem to roughly bear out a premise that over a wide range of population densities and of total populations, the automobile and truck usage per capita is roughly constant, so that total motor vehicle usage is roughly proportional to the population density.

The nature of the noise generated by highway traffic and hence the annoyance are functions of a number of key variables; namely, volume of vehicle flow, average speed, percentage of heavy trucks and highway grade.

Considering first the broad category of roads labeled freeways or major highways, one finds that noise from heavy traffic on such highways may generally be described as nearly continuous. That is, for the majority of the time, individual vehicles are not clearly discernable, but rather simply contribute to the mean noise level. The energy average of this continuous traffic noise level increases with increasing vehicle speed by approximately 9 dB for each doubling of velocity (or 30 times the logarithm of the velocity ratio). The continuous noise level will also increase at a rate of 3 dB per doubling of vehicle density (10 times the logarithm of the vehicle density). Over and above this continuous noise, however, individual noisy vehicles create intrusions above the mean level. An increase in these intrusive events increases the standard deviation of the traffic noise and it is postulated that this variation in noise level (i.e., the standard deviation) correlates better with subjective annoyance than the mean energy-average noise level. This suggests that a reduction in automobile noise which is achieved without also reducing the intrusive noise events (i.e., heavy trucks, motorcycles, hot rods, etc.) would serve to reduce the mean energy noise levels, but would potentially increase annoyance by increasing the intrusiveness of noise from single vehicles.

Consider next the noise characterized by less densely flowing traffic on major and minor traffic arterials (non-freeway). Under these situations, the noise produced by traffic flow becomes discontinuous as low flow densities occur. When this happens, the traffic noise becomes characterized by a series of discrete single events of varying magnitude and duration; hence, a lower mean energy level, but a higher standard deviation which may significantly contribute to annoyance. Under stop and go traffic conditions, due to their low gearing, truck influence is significantly increased as they must accelerate through the gears to attain speed and hence the truck exhaust noise component becomes a dominant factor. Automobiles, on the other hand, under normal driving conditions, do not produce excessive noise under acceleration. Thus, when the mean speed of automobiles is reduced through traffic signals or stop signs, their mean noise level will drop. We may thus conclude that stop and go traffic conditions contribute to the variant nature of traffic noise, increase the standard deviation of the noise and hence, may increase the relative annoyance. Clearly, the noise abatement countermeasure implications of these concepts is that operational changes in traffic flow may offer some advantages for noise reduction.

Mechanisms of Traffic Noise Generation

Thus far, only the general nature of the noise emitted by the traffic stream has been considered. However, to place in perspective the available countermeasures which may be applied to reduce the impact of highway vehicles, one need consider the mechanisms of the noise generated by vehicles themselves. In so doing, the major noise producing components of the two major classifications of highway vehicles, automobiles (including light trucks - under 10,000 pounds GVW) and heavy trucks must be assessed. We may generally relate the noise produced by individual vehicles as pertaining to the following three major noise generating systems:

- Rolling stock; tires and gearing
- Propulsion system; engine and related accessories
- Aerodynamic and body

Considering first, automobiles; at low speed and under severe acceleration, the engine exhaust component dominates. Secondary sources (although sometimes equally significant to the exhaust under full acceleration) include induction system and cooling fan noise. Conventional designed automobiles have enclosed engines and gearing so that the mechanical noise of these components is usually well below that of the other sources. Engine mechanical noise is usually more of a problem on imported and compact vehicles than for domestic automobiles due to lighter construction, engine placement, and smaller engines which require higher rpm's to achieve power. At higher vehicle speeds (35 miles per hour and above), tire noise becomes a significant source. At highway cruising speeds, current automobile tires produce noise levels in the range of 65 to 75 dBA at 50 feet. These are generally the controlling noise source for newer automobiles at high speed.

The noise output of heavy trucks is largely dominated by the low frequency exhaust component at speeds up to approximately 40 miles per hour where the tire component begins to rapidly increase in significance. At higher speeds (55 to 60 mph), the tire component may contribute equally to the exhaust noise or may totally dominate, depending on the road surface characteristics, the tire tread design, number of tires, and the vehicle weight. Under low speed acceleration conditions, the exhaust component normally dominates; however, other sources may play an equally significant role. These sources include engine/mechanical noise, induction noise, and cooling fan noise.

The City has little authority to directly affect these individual traffic noise sources; however, a number of positive actions may be undertaken to promote action at the state and federal levels. Some suggestions for action are outlined below:

- Seek Federal and State assistance for future noise studies including quieter transportation systems, community noise surveys and monitoring.
- Adopt noise criteria for use in the purchase of all City-owned motorized vehicles.

- The State of California has, at present, a sliding scale for new vehicle noise reduction down to the level of 70 dBA by the year 1987. Tables 3-15, 3-16, 3-17, and 3-18 provide the State criteria levels including noise limits for motorboats. The City should keep itself apprised of any changes to this by the State Legislature and, in general, lend support to noise related measures initiated by the State Environmental Quality Study Council.

- Similarly, the City should follow actions by the EPA at the federal level concerning upcoming car and truck noise emission regulations and lend support or criticism as appropriate.

- The City may itself wish to establish more comprehensive enforcement procedures to effect compliance with noise standards.

Table 3-15

Motor Vehicle Noise Standards

The following standards were promulgated by the State Department of Motor Vehicles, Section 23130, 23130.5, Motor Vehicle Code. They were based on measurements 50 feet from the center of the lane of travel, and were applicable January 1, 1973.

	Speed Limits	
	35 mph or Less	More Than 35 mph
Any motor vehicle with a manufacturer's gross vehicle weight rating of 6000 lbs. or more, and any combination of vehicles towed by such motor vehicle	86 dBA	90 dBA
Any motorcycle other than a motor-driven cycle	82 dBA	86 dBA
Any other motor vehicle and any combination of vehicles towed by such motor vehicle	76 dBA	82 dBA

Table 3-16

Noise Limits for New Motor Vehicles
State of California*

S27160. (a) No person shall sell or offer for sale a new motor vehicle which produces a maximum noise exceeding the following noise limit at a distance of 50 feet from the centerline of travel under test procedures established by the Department:		
1.	Any motorcycle manufactured before 1970	92 dBA
2.	Any motorcycle, other than a motor-driven cycle, manufactured after 1969, and before 1973	88 dBA
3.	Any motorcycle, other than a motor-driven cycle, manufactured after 1972, and before 1975	86 dBA
4.	Any motorcycle, other than a motor-driven cycle, manufactured after 1974, and before 1978	80 dBA
5.	Any motorcycle, other and a motor-driven cycle, manufactured after 1977, and before 1988	75 dBA
6.	Any motorcycle, other than a motor-driven cycle, manufactured after 1957	70 dBA
7.	Any snowmobile manufactured on or after January 1, 1973, and before January 1, 1975.	82 dBA
8.	Any motor vehicle with a gross vehicle weight rating of 6000 pounds or more manufactured after 1967, and before 1973	88 dBA
9.	Any motor vehicle with a gross vehicle weight rating of 6000 pounds or more manufactured after 1972, and before 1975	86 dBA
10.	Any motor vehicle with a gross vehicle weight rating of 6000 pounds or more manufactured after 1974, and before 1978	83 dBA
11.	Any motor vehicle with a gross vehicle weight rating of 6000 pounds or more manufactured after 1977, and before 1988	80 dBA
12.	Any motor vehicle with a gross vehicle weight rating of 6000 pounds or more manufactured after 1987	70 dBA
13.	Any other motor vehicle manufactured after 1967, and before 1973	86 dBA
14.	Any other motor vehicle manufactured after 1972, and before 1975	84 dBA
15.	Any other motor vehicle manufactured after 1974, and before 1978	80 dBA
16.	Any other motor vehicle manufactured after 1987	70 dBA

*Source: Section 27160, Motor Vehicle Code

Table 3-17

Noise Limits for New Off Highway Motor Vehicles
State of California*

•	Any such vehicle manufactured on or after January 1, 1972, and before January 1, 1973	92 dBA
•	Any such vehicle manufactured on or after January 1, 1973, and before January 1, 1975	88 dBA
•	Any such vehicle manufactured on or after January 1, 1975	86 dBA

*Source: Section 38280, Motor Vehicle Code

Table 3-18

Noise Limits for Motorboats in or Upon Inland Waters
State of California*

- For engines manufactured on or after January 1, 1974, and before January 1, 1976, a noise level of 86 dBA measured at a distance of 50 feet from the motorboat.
- For engines manufactured on or after January 1, 1976, or before January 1, 1978, a noise level of 83 dBA measured at a distance of 50 feet from the motorboat.
- For engines manufactured on or after January 1, 1978, a noise level of 82 dBA measured at a distance of 50 feet from the motorboat.

*Source: Section 654.05, Harbor and Navigation Code

The following sections outline specific abatement measures oriented toward reducing the total noise created by the traffic stream.

Operational Traffic Noise Abatement Measures

The noise abatement proposals outlined below are oriented toward reduction of the cumulative noise emitted by the traffic stream through operational modifications as opposed to physical source modifications which are generally beyond the control of local jurisdictions.

1. Revise flow control methods on surface streets to maximize steady flow conditions. Thus, through maintenance of steady speed conditions, the mean level may increase slightly; however, the standard deviation of the traffic noise (influenced by stop and go-braking and acceleration) will decline.

2. Reroute traffic - either by type, i.e., restrict usage by heavy trucks or impose curfews for noisier vehicle types or physical relocation, i.e., place noisier vehicles on innermost traffic lanes to achieve increased path distance to observer and effective barrier shielding by other vehicles.

3. Alter highway designs to achieve improved noise reduction and incorporate these features in new highways. Use depressed highway configurations (30 feet depressed with 2:1 side wall slope will yield approximately 10 to 12 dBA reduction). Route through cuttings in populated areas.

   When elevated highway designs are required, low or intermediate height roadside barriers should be incorporated in the design because, although the elevated configuration provides an effective shielding of close-in property (~200 feet), it acts as a level roadway at further distances and thus is in some instances self-defeating in that barrier effects of close-in buildings are negated.

4. General Incorporation of Roadside Barriers:

   - Short barriers (3 to 5 feet) are most effective when used in conjunction conjunction with elevated roadways.

   - 8 to 12 feet barriers along level roadways are moderately effective yielding 10 to 12 dB reduction close in and 4 to 6 dB reduction in traffic noise at greater distances from the barriers.

5. Restrict residential usage of buffer zone on either side of highways - rezone to light industrial or commercial usage or require "sound insulated design" multifamily units in this buffer zone. This serves to increase the path distance to "sensitive" observers.

6. Reduce allowable vehicle speeds on major highways and freeways. Care need be exercised such that the noisier vehicles do not become more evident as a result of lower mean levels.

7. Designate quiet zones by banning noisy vehicles from certain streets, high ways, or freeways.

Traffic Noise Reduction at the Receiver - Dwelling Modifications

This section summarizes some practical experience in the areas of modifying existing dwellings to achieve improved sound insulation. The basic considerations reported herein are based upon studies by Wyle of actual dwelling improvements in the vicinity of a major airport.* Thus, these modifications were oriented toward treatment of the total dwelling. For ground transportation noise sources or directional stationary sources, it may be possible to achieve desired interior noise levels through treatment only of facing walls. The soundproofing treatments and the relative effort involved in these modifications are summarized below under the categories of minor, moderate, and major dwelling modifications.

*Home Soundproofing Pilot Project for the Los Angeles Department of Airports, Wyle Research Report No. WCR 70-1, Wyle Laboratories, El Segundo, California, March 1970.

Minor Dwelling Modifications

Through attention to details such as minimization of "sound leaks" around doors, windows, and vents and replacement of "acoustically weak" components, outside to inside noise reduction of A-weighted noise levels of the order of 20 to 22 dB is obtainable. These improvements consist primarily of adequate weatherstripping around doors, assurance of snug fitting doors and windows, elimination of louvered windows and treatment of exterior vents (chimneys and kitchen or bathroom fans in particular). In addition, exterior hollow core doors need be replaced with the solid core variety.

Moderate Dwelling Modifications

Moderate modifications would include all of those listed under "minor" plus major attention to the weaker housing components; namely, windows. The most effective window treatments consist of double glazing or sealed windows. In both cases, this usually necessitates air conditioning the dwelling, if not already done. Additional attention is given to the attic by acoustical treatment of attic vents, increased sound absorption material (and hence better heat insulation) in the attic space, and when required, finishing of the crawl space areas with gypsum board. Such treatments will produce overall sound insulation on the order of 30 dB for A-weighted noise levels.

Major Dwelling Modifications

Major modifications consist of all items under "minor" and "intermediate," plus some structural improvements of weak walls and roofs. These changes would include elimination or suitable modification of exposed beam roof/ceiling designs and a general "beefing up" of exterior walls. Sufficient exterior wall improvement may normally be attained by installation of an extra layer of gypsum board on the interior surfaces over sheets of sound deadening board or by securing it to resilient channels. Where possible, double-entry doors or vestibule entrances could be incorporated. In lieu of these, "acoustic" doors are required. Improvements in sound insulation available from these changes may yield noise reductions of the order of 40 dB for A-weighted noise levels.

A summary of improvements obtained and the relative costs in 1970 for the referenced Wyle study is presented below in Table 3-19. Additional detail is provided in Tables 3-20, 3-21, and 3-22.

Table 3-19

Summary of Dwelling Sound Insulation Measures
and Relative Costs

Actual construction costs for the modifications (including labor, materials, and contractor's overhead and profit) were as follows:*

Degree of Modification/ Level of Noise Reduction		Cost Per House**	Cost Per Square Foot of Floor Area
Minor:	20 dB	$ 3,210	$2.10
Intermediate:	30 dB	$ 4,820	$3.15
Major:	40 dB	$12,550	$8.20

For soundproofing programs significantly larger than this pilot program, these costs might be reduced approximately 10 to 20 percent.

* Wyle Report WCR 70-1, LAX Home Soundproofing Project, March 1970.

**Normalized to the average house size (1530 square feet of floor area), and applicable to houses without beamed ceilings.

To achieve compatible land use through improved sound insulation in building structures, it will be necessary to amend the building code to achieve two objectives:

1. Incorporate adequate exterior to interior noise reduction in new construction to abate external noise, and

2. Establish minimum requirements for internal noise reduction in multifamily dwellings, hotels, and motels to achieve desired acoustical privacy.

It is felt that both of these changes provide a legal basis for noise abatement which is of direct benefit to the people and is not costly to implement.

Table 3-20 Average Cost for Soundproofing* Stage 1 Houses

House Elements	Labor	Material	Total
Windows	$ 205.00	$ 53.00	$ 258.00
Doors	160.00	178.00	338.00
Ventilation	652.00	442.00	1,094.00
Misc.	1,030.00	690.00	1,720.00
Total	$ 2,047.00	$1,363.00	$ 3,410.00

Table 3-21 Average Cost for Soundproofing* Stage 2 Houses

House Elements	Labor	Material	Total
Windows	$ 875.00	$1,238.00	$ 2,113.00
Doors	234.00	286.00	520.00
Beamed Ceiling	407.00	335.00	742.00
Ventilation	884.00	1,000.00	1,884.00
Misc.	254.00	107.00	361.00
Total	$ 2,654.00	$2,966.00	$ 5,620.00

Table 3-22 Average Cost for Soundproofing* Stage 3 Houses

House Elements	Labor	Material	Total
Windows	$ 1,213.00	$2,300.00	$ 3,513.00
Doors	226.00	450.00	676.00
Ceiling	397.00	452.00	849.00
Floors	667.00	198.00	865.00
Walls	764.00	570.00	1,334.00
Ventilation	1,050.00	1,060.00	2,110.00
Misc.	725.00	369.00	1,094.00
Total	$ 5,042.00	$5,399.00	$10,441.00

*Stage 1 = Minor Modifications
*Stage 2 = Intermediate Modifications
*Stage 3 = Major Modifications

3.10.2 Railroad Noise and Mitigation Measures

Although the EPA is in the process of developing noise specifications for railroad operations, to this date there exist no federal or state standards for railroad noise. The reason for the apparent lack of activity in this area may be attributed to the fact that railroad noise exerts only a small impact in the overall problem of transportation noise.

The State CIR Guidelines do, however, apply to railroad noise impact as do the land use compatibility recommendations.

The major sources of railroad noise are identified below:

Locomotives

- Fan noise
- Exhaust noise
- Wheel/rail interaction noise

Yard Operations

- Engine load tests
- Hump yard operations including car impact and retarder noise
- Flat yard operations.
- Idling switch engines, including round house operations
- Horns, whistles, bells, alarms in yard
- In yard shop and other yard operations
- Mechanical refrigeration cars

Table 3-23 provides some indications of typical noise levels produced by yard operations.

Line Operations

- Operations at grade – variations in noise output levels due to up and downgrade conditions as well as wheel-rail noises produced by cornering, braking and network crossovers.

Table 3-23

Typical Mean-Maximum Noise Levels Produced by Railroad Yard Operations

Significant Yard Noise Producing Operations	Noise Level at 100 ft, dB(A)
1. Switcher engine movements	
a. Steady Pull Through Yard	76-80
b. Classification Start-Stop Cycle	80
2. Idling Locomotives	
a. Road Engine	71
b. Switch Engine	65
3. Car Impacts	
a. Single or multiple cars into parked cars - coupling	91
b. Chain reaction impacts - start-up or stopping of a line of cars	91
4. Car Retarders	
a. Master	110
b. Group retarders or individual track retarders	110
c. Inert or pull-out retarders	95
5. Loudspeakers and PA Systems (at 0 degrees)	90-95
6. Auxiliary Service Operations Performed in Yards	
a. Engine load tests (at No. 8 Throttle)	92
b. Locomotive Service Racks	(as in 2a)
c. Operation of stationary mechanical refrigeration car	
- Engine-Generator Side	64-74
- Condenser Side	59-68

Table 3-24

Variables Affecting Freight Car Wheel/Rail Noise Emission

Variable	Increase in A-Weighted Noise Level*	Comments
1. Jointed Rails (vs. Welded)	4 to 8 dB(A)	Generally no correction for main line tracks; assign higher value to low speed classified track
2. Presence of Grade Crossings and Frogs	6 to 8 dB(A)	
3. Wheel Irregularities - Flat Spots or Built-up Tread	to 15 dB(A)	
4. Passage Over Bridgework		Use lower range of corrections for heavier structures
a. Light Steel Structure	to 30 dB(A)	
b. Heavy Steel Structure	to 15 dB(A)	
c. Concrete Structure	0 to 12 dB(A)	
5. Short Radius Curves		Random occurrence of wheel squeal
a. Less than 600 Ft. Radius	15 to 25 dB(A)	
b. 600 to 900 Ft. Radius	5 to 15 dB(A)	

*These factors are assumed to act individually. When in combinations of two or more, the net increase will not be equal to the sum of each component, but most likely the largest individual factor.

- Operating speeds
- Operations above grade (elevated right-of-way)
- Railroad crossings:

  Warning devices at crossing gates – bells, alarms, horns

  Locomotive/train noise at crossings

Factors which significantly increase the noise levels from the variables of wheel/rail emissions are identified in Table 3-24.

Mitigating measures for railroad operations may be divided into three basic areas:

- Noise reduction at the source
- Changes in operating procedures
- Land use alternatives

<u>Source Reduction Recommendations</u>

- Muffling locomotive exhaust and intake
- Vibration isolating the locomotive engines
- Modification of locomotive fan blade shape
- Modification of train whistles in their directivity and frequencies
- Use of welded rails
- Rails ground for smoothness
- Wheels with resilient inserts between hub and rim
- Rail mounting with resilient supports or mounting entire track slab on resilient supports

<u>Operating Procedures Recommendations</u>

- Use of lower speeds, especially when passing through noise-sensitive areas
- Possible nighttime curfews or rescheduling (imposition of curfews must consider the secondary impacts of ground traffic congestion during day-time hours)
- Use of long radius curves

Land Use Considerations

- Use of below grade level rights-of-way
- Use of concrete bridgework structures
- Houses near tracks require many of the same modifications as houses near other high noise transportation sources with additional consideration to ground-borne vibrations
- Use of barriers in noise-sensitive areas

Barriers such as an earth berm, wood and fill, precast concrete or block wall must be at least to the height of the engine exhaust. Figures 3-25 and 3-26 illustrate barrier attenuation.

For a more detailed analysis of railroad noise, Reference 26 should be consulted.

For the purpose of obtaining some conservative estimates of noise levels for any future rail system which may operate in Huntington Beach, the procedures in Appendix C may be applied.

3.10.3 Aircraft Noise Criteria Levels and Mitigation Measures

Aircraft noise is being reduced by the combined efforts of the Environmental Protection Agency (EPA), the Federal Aviation Administration (FAA), Federal Department of Transportation (DOT), jet engine manufacturers, the airlines and airport authorities. Solutions being sought include:

1. Reduction of engine noise on new and old aircraft (FAR 36).
2. Instituting flight paths that affect the least number of people.
3. Instituting a takeoff and landing procedure that includes steep ascent and descent, to keep the aircraft at high altitudes over populated areas.
4. Require throttle cutbacks over highly sensitive areas.
5. Restrict the number of flights; especially at night.

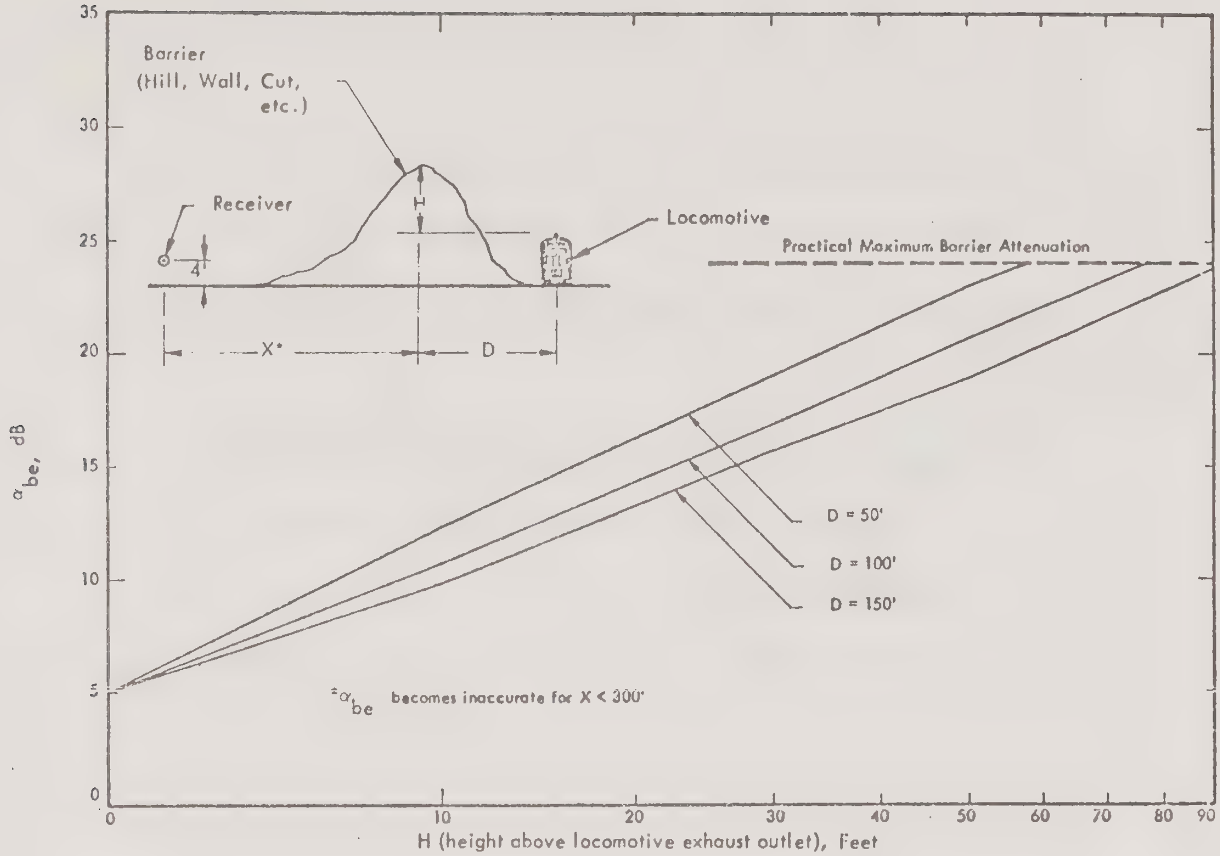


Figure 3-25. Attenuation of Locomotive Sound Level Due to a Shielding Barrier

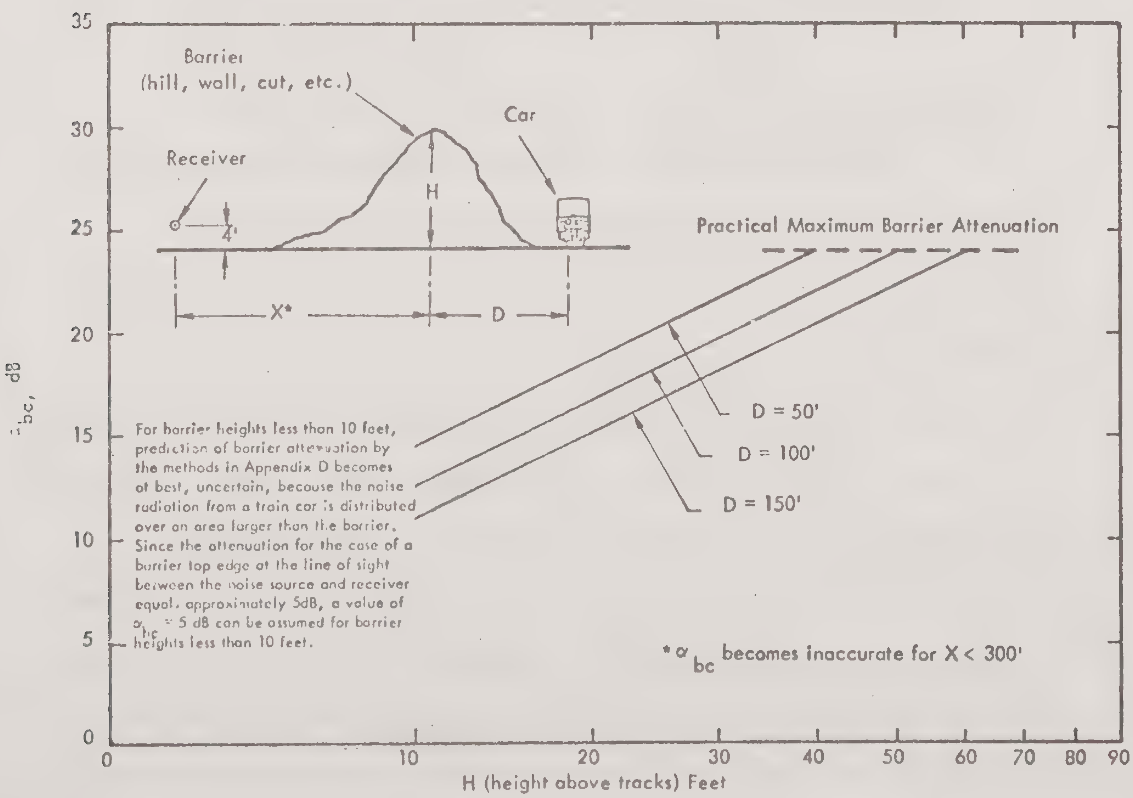


Figure 3-26. Attenuation of Car Sound Level Due to Shielding Barrier

6. Pass sensible zoning restrictions for land use near airports.

7. Relocate airports far from cities, and improve ground transportation.

In response to the problems created by aircraft noise, the NCA requires EPA to conduct a study of:

1. The adequacy of FAA flight and operational noise controls.

2. The adequacy of present aircraft noise emission standards (including recommendations on retrofit).

3. The implications of achieving levels of cumulative noise exposure around airports.

4. Additional measures available to airport operators and local governments to control noise.

In accordance with these provisions, EPA recently submitted a report to Congress. In the report, the administrator indicated the following proposals will be forthcoming:

1. Regulations concerning flight and operational noise controls: The regulations will include options for takeoff procedures, approach and landing procedures, and minimum flight altitudes.

2. Amendments to FAR Part 36 to specify lower noise levels for future aircraft.

3. Regulations to control and reduce the noise emissions from existing aircraft. The FAA's proposed Fleet Noise Level (FNL) methodology will be considered as a flexible means of promoting any of the source technology options (nacelle treatment, refan, or aircraft replacement).

4. Cooperative actions to develop an airport noise certification regulation that will insure control over cumulative noise near airports.

The NCA required the EPA to submit to FAA recommendations for regulations which EPA feels are necessary to protect the public health and welfare.

FAA retains the power to prescribe and amend aircraft noise measurement and noise emission regulations as authorized under Section 611 of the FAA Act of 1958. This is to insure that the regulations proposed by EPA will not interfere with aircraft safety. The Act outlines in detail the process for public dissemination of the information regarding the FAA's action on the EPA's recommendations.

Under the FAA Act of 1958, the Civil Aeronautics Board (CAB) is directed to regulate the economic aspects of the airline industry. In addition, with the passage of the National Environmental Policy Act of 1970, CAB was given the authority to deny a certificate authorizing air transportation if it finds that the inverse impact on the environment outweighs whatever factors point to the grant of the certificate.

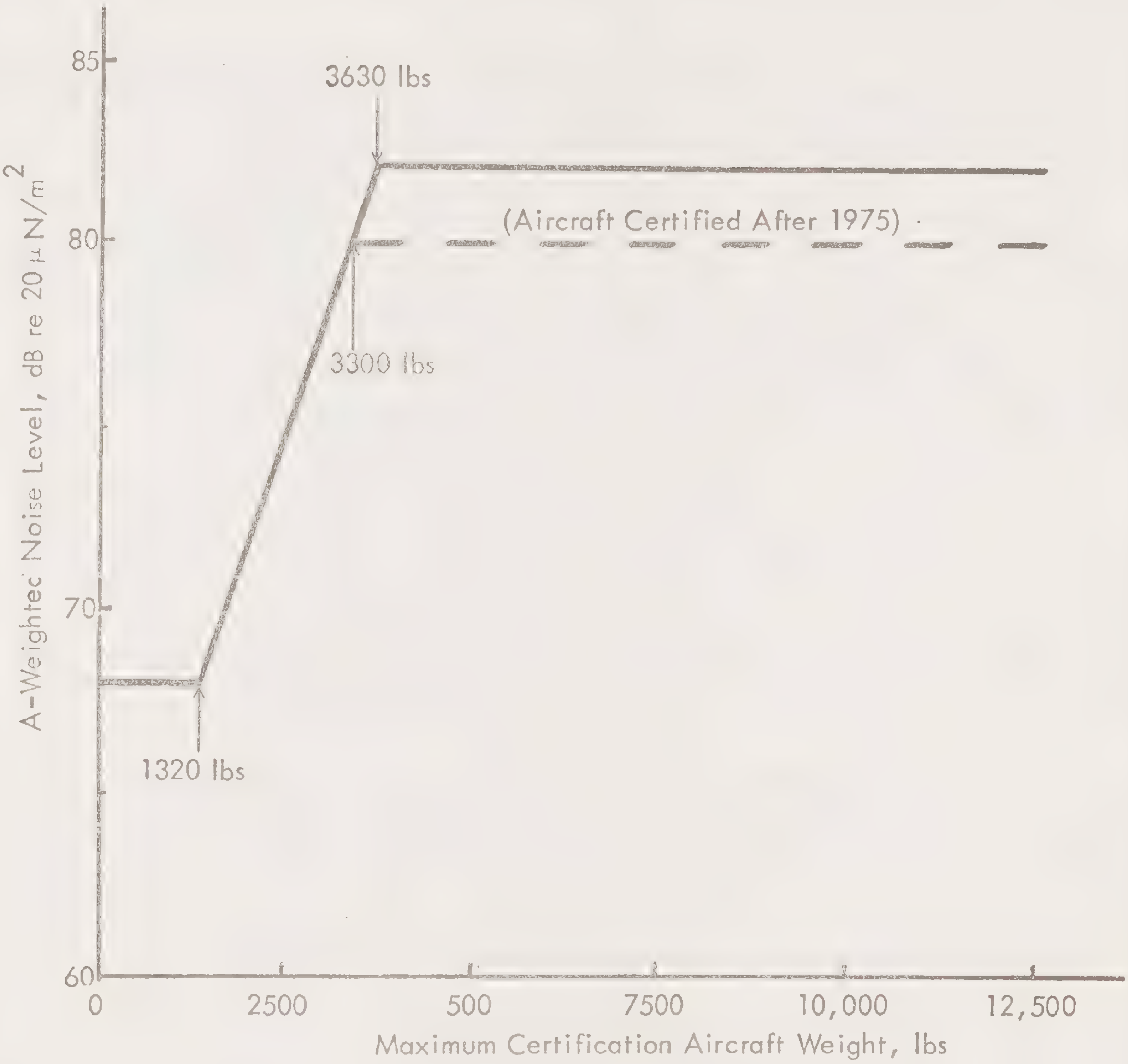
In response to recent concerns for General Aviation Airports, both the FAA and EPA are in the process of developing noise standards for propeller-driven small airplanes. The proposed FAA standard is identified in Figure 3-27.

The principal noise control techniques for these airplanes are:

- Shielding the engine with proper covers,
- Providing the engine with proper mufflers,
- Reducing propeller tip speed, and
- Increasing propeller efficiency.

Similar operational and land use techniques apply here as previously indicated for air carrier jet operations.

California Public Utilities Code (Section 21669 et. seq.) provides noise standards to protect the public from aircraft noise and to resolve the incompatibilities between airports and their neighbors. The regulations are applicable to all operations of civilian aircraft and aircraft engines which produce noise, to the degree that such operations are not already limited by federal law. The regulations serve as additions



Measurement Conditions

Aircraft Height – 1000' ± 30'
Elevation Angle – ±10° from zenith when passing overhead

Temperature: 41° – 86°F (correction required if outside of 59°F to 77°F)

Humidity: 30% – 90% (correction required if outside of 40% – 90% relative humidity)

Wind: < 10 kts ±15° to flight path (windscreen required over 6 kts)

Microphone Height: Approximately 4 ft (corrections required for rate of climb and takeoff distance)

Figure 3-27. Proposed FAA Regulations for Noise from Small Propeller-Driven Aircraft (Reference: Federal Register, October 10, 1973)

to remedies provided for by other laws and are not intended to prevent local governments from setting more stringent standards.

The State requires each County to determine which of the airports within its boundaries are required to initiate aircraft noise monitoring in accordance with the State regulations. The County is responsible for validating the airport's noise monitoring, enforcing regulations, and submitting quarterly reports to the State Department of Aeronautics, including: a map of the noise impact boundary, daily CNEL measurements, and the total number of recorded violations of the noise limits.

State law finds that the area of land within the noise impact boundary is compatible with the following uses:

1. Agricultural, airport, industrial and commercial property.
2. Property subject to aviation easement for noise.
3. Zoned open space.
4. Apartments with adequate insulation and central air conditioning.
5. Acoustically treated single-family homes.

Section 21670 et. seq. of the Public Utilities Code requires each county to form an Airport Land Use Commission responsible for formulating a comprehensive land use plan for all Airport Influence Areas.

The Division of Aeronautics, State Department of Transportation, Noise Standard Regulations were adopted on November 10, 1970, as Title 4, Subchapter 6, of the California Administration Code, in accordance with Division 9, Part 1, Chapter 4, Article 3 of the California Public Utilities Code. It is recommended that repeal or amendment of these regulations by the State shall not effect this section of the Plan.

The criterion CNEL for airports which have four-engine turbojet or turbofan air carrier aircraft operations and at least 25,000 annual air carrier operations (takeoffs plus landing) is as follows:

Date	CNEL in dBA
Effective date of regulations to 12-31-75	80
1-1-76 to 12-31-80	75
1-1-81 to 12-31-85	70
1-1-86 and thereafter	65

The criterion for new airports and vacated military airports converted to civilian use is:	65

The criterion for civilian airports is:

Effective date of regulations to 12-31-85	70
1-1-86 and thereafter	65

Although the State has not specifically identified General Aviation Airports (non-jet), it is recommended that these facilities comply with the same standard.

3.10.4 General Noise Sources Criteria

Industrial noise levels that cause hearing loss are prohibited by the Walsh-Healy Public Contracts Act and the National Occupational Safety and Health Act (OSHA). These acts set a maximum allowable exposure time of 8 hours for noise levels above 90 dB(A), a level at which you must shout in order to be heard just 2 feet away. The Walsh-Healy Act applies the limits to contractors supplying the Federal Government with materials, supplies, articles or equipment under contracts in excess of $10,000. The OSHA is applicable to all businesses which are engaged in interstate commerce. In neither case do these acts preempt state or local governments.

Another federal noise regulation is contained in the Department of Housing and Urban Development (HUD) Circular 1390.2, which establishes noise exposure policies and standards to be used in the approval or disapproval of all HUD assisted projects. The authority for this circular is based on Section 102(2)(c) of the National Environmental Policy Act of 1969.

The NCA gives the EPA authority to prescribe standards limiting the noise generating characteristics for any product or class of products which has been identified as a major source of noise and which falls in the following categories:

- Construction equipment
- Transportation equipment (including recreational vehicles)
- Any motor or engine
- Electrical or electronic equipment

The standards for these products must be based on those set by research study reports and maximum noise levels which are necessary to protect the public health or welfare. Furthermore, EPA must require the manufacturer of any product whose noise emission may adversely affect the public health or welfare, or which is sold on the basis of its effectiveness in reducing noise, to give notice of the noise level or its effectiveness in reducing noise to the consumer. In no instance can state or local governments set noise standards different from those set by the EPA, unless such standards regulate the use, operation or movement of products (as opposed to their manufacture.

In California, Section 21001 of the California Environmental Quality Act declares that it is the policy of the State to require governmental agencies at all levels to develop standards and procedures necessary to provide the people of California freedom from excessive noise. Section 24180-81 of the California Health and Safety Code established a State Office of Noise Control to provide technical assistance to local jurisdictions to help combat noise pollution.

The control of industrial noise remains within the authority of the State Division of Industrial Safety which is responsible for enforcing the noise abatement regulations in Section 5095 et. seq. of the California Administrative Code.

Section 415 of the California Penal Code prohibits disturbing the peace by any loud or unusual noise. Section 65302(g) of the California Government Code requires a noise element in all city and county general plans.

Local jurisdictions may enact noise regulations to secure and promote the public health and welfare as an exercise of their police power as long as they are not in conflict with general laws (Section VII, Article XI of the California State Constitution.

Loud and Unusual Noises

The prohibition of unnecessary, excessive and annoying noises falls within the jurisdiction of the local authority which may declare such noises illegal by ordinance. These may include:

- Horns and signaling devices or private property
- Drums
- Animals and fowls
- Steam whistles
- Engines in nonmoving motor vehicles

At present such noises cannot effectively be controlled by decibel standards and are best handled by disturbing-the-peace ordinances. The lack of objective criteria for nuisances of this type plus a lack of sufficient around-the-clock enforcement limit the alternatives.

Construction Noise

The EPA is responsible for requiring that manufacturers limit the noise-generating characteristics of the construction equipment they produce to fit EPA standards. A local authority may place a curfew on construction that creates unnecessary, offensive or excessive noise as well as restrict the use of construction equipment that breaks quantitative acoustical standards in a noise ordinance.

Other Noise Regulations

The local authority may enact standards limiting noise emissions which cross property lines. The use of property is generally required to conform with the performance standards stated in the noise ordinance. These performance standards are

meant to apply to noise-generating apparatus or activities within a particular area and are not to be confused with the new product standards of EPA. License and permit type provisions may be used to limit or require compliance with performance standards as a condition to the installation or operation of equipment. In addition, curfews may be set to prohibit certain noise-generating activities during a specified time interval, usually at night.

Zoning provisions may also be adopted to determine the relative compatibility of a particular land use to the noise. For example, land use for manufacturing would be compatible where noise levels are considered excessive, while residential land use would be incompatible with excessive noise.

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4.0 DRAFT NOISE ORDINANCE

Included in this section is a Draft Noise Ordinance. This Ordinance was adapted and modified from an original model developed by the National Environmental Health Association* and has been identified as a most promising working tool in the area of noise control and enforcement.

4.1 Techniques for Monitoring Community Noise

Introduction

The assessment of community noise environments may be approached on two levels of increasing sophistication and complexity. California Government Code 65302(g) is geared to the more complex approach which considers not just the magnitude of the noise produced, but individual event durations and frequency of occurrence. These additional factors are combined with basic noise level information to produce a rating scale (CNEL or L_{dn} as referred to herein) which correlates well with expected human reaction to noise. As such, these techniques yield noise exposure information which is of value for land use planning and detailed assessment of noise impact upon the population. However, due to the complexities involved, CNEL or L_{dn} noise rating scales are not well suited for field noise monitoring efforts by other than qualified acousticians. The measure of environmental noise which may be utilized at the local level and with relatively simple sound level measurement equipment, is the A-weighted measurement of residual (or ambient) noise levels. Such A-weighted measurements are fully compatible with the more detailed CNEL scale in that CNEL is based upon A-weighted noise information. Thus, a community may operate in terms of two rating scales; CNEL (or comparable), which is appropriate for planning and detailed impact analysis and dBA, which is suitable for local monitoring and enforcement.

*National Environmental Health Association, "Proposed Community Noise and Vibration Control Ordinance," October 25, 1974.

Sound Level Measurement Technique

The technique described herein is an adaptation of a proposed ANSI Standard (ANSI-S3-W-50) for measurement of community noise which has been utilized by Wyle Research in a number of community noise surveys. It is based upon visual observation of noise levels using the A-weighted network on a Type 2 or better sound level meter (ANSI S1.4-1971). The sound level meter should be properly calibrated before and after each set of readings and a windscreen should be used for all measurements. Also, when taking readings, it is necessary to be certain that nearby reflecting objects do not affect the measurements.

The basic procedure for reading the sound level meter is as follows (the sound level meter should be set on the A-weighting network and "slow" meter damping characteristics):

1. Observe the A-level reading for five (5) seconds and record the best estimate of central tendency and the range of the meter deflections.
2. Repeat the observations noted above until the number of readings equal or exceed the spread (in decibels) of all of the readings.
3. Find the arithmetic mean average of the readings in (2) above and identify this estimate as the ambient noise level for this particular location and measuring time.

General Guidelines

Data should be gathered primarily near residences and other locations of interest such as near hospitals, schools, parks, and churches.

The sampling area must be defined as geographical area such as a neighborhood, a section, or an area, depending on the purpose for collecting data. Measurement locations must be selected to provide adequate sampling of this area.

Measurements should not be made in weather conditions which may create a bias in the data. Examples of weather conditions which can create a bias in data are:

1. Wind in excess of 15 mph regardless of the windscreen used.

2. Rain or thunder.

Measurements should not be made if significant changes in noise making activity or pattern occur during the sampling period. Examples of changes in noise making activities or pattern which affect the data are:

1. Nearby noise sources such as powermowers, pavement breakers, brush cutters, or power saws.

2. Changes in vehicular traffic flow such as temporarily closed streets, detours, or shift-change periods near industrial plants.

- Enforcement Tools

In selecting the appropriate noise monitoring equipment for enforcement by Huntington Beach personnel, the following criteria are recommended.

- • The meter(s) should be a self-contained, portable hand-held unit, equipped with an "A" weighted network and a slow response characteristic.

- • The meter(s) should be of a type that is easily calibrated and operated by inexperienced personnel without extensive training.

- • The meter(s) should be in a price range which would be economically feasible for the City to purchase.

An octave band analyzer is not recommended at this time for the following reasons:

- • It is difficult for inexperienced personnel to obtain and interpret frequency analyses (in each band) of varying sound levels as found in the community without undergoing substantial training.

- An octave band analysis of a sound does not necessarily correlate directly to the response of the human ear without extensive evaluation, while the "A" weighted network of a sound level meter gives a quick, rough estimate of the response of the human ear to sound levels.
- The time commitment would be increased for survey work due to the increased number of readings necessary to determine the total noise for all frequency bands.
- An octave band analyzer costs substantially more than the sound level meter.

DRAFT

COMMUNITY NOISE AND VIBRATION CONTROL ORDINANCE

ORDINANCE NO. _____

AN ORDINANCE OF THE CITY OF HUNTINGTON BEACH ADDING CHAPTER _______ TO TITLE _____ OF THE MUNICIPAL CODE RELATING TO THE CONTROL OF NOISE AND VIBRATION.

SECTION A. The City Council (Board of Supervisors) of the City of Huntington Beach does ordain as follows:

ARTICLE I

Chapter _____ is added to the _________________________ Municipal Code

Section	1.	Declaration of Policy
Section	2.	Definitions.
Section	3.	Decibel Measurement Criteria.
Section	4.	Designated Noise Zones.
Section	5.	Exterior Noise Standards.
Section	6.	Interior Noise Standards.
Section	7.	Special Provisions.
Section	8.	Schools, Hospitals and Churches - Special Provisions.
Section	9.	Air Conditioning and Refrigeration - Special Provisions.
Section	10.	Noise Level Measurements.
Section	11.	Vibration Standard.
Section	12.	Proposed Developments.
Section	13.	Variance Procedures.
Section	14.	Noise Variance Board.
Section	15.	Appeals.
Section	16.	Prima Facie Violation..
Section	17.	Violations: Misdemeanors.
Section	18.	Violations: Additional Remedies - Injunctions.
Section	19.	Manner of Enforcement.
Section	20.	Delay in Implementation - Fixed Noise Sources.
Section	21.	Severability.

Section 1. Declaration of Policy

In order to control unnecessary, excessive and annoying noise and vibration in the City of Huntington Beach, it is hereby declared to be the policy of the City to prohibit such noise and vibration generated from or by all sources as specified in this Chapter.

It is determined that certain noise levels and vibration are detrimental to the public health, welfare and safety and contrary to public interest, and therefore, the City Council of the City does ordain and declare that creating, maintaining, causing or allowing to be

created, caused or maintained any noise or vibration in a manner prohibited by or not in conformity with the provisions of this Chapter, is a public nuisance and shall be punishable as such.

Section 2. Definitions

The following words, phrases and terms as used in this Chapter shall have the meaning as indicated below:

(a) AGRICULTURAL PROPERTY shall mean a parcel of real property which is undeveloped for any use other than agricultural purposes.

(b) AMBIENT NOISE LEVEL shall mean the all-encompassing noise level associated with a given environment, being a composite of sounds from all sources, excluding the alleged offensive noise, at the location and approximate time at which a comparison with the alleged offensive noise is to be made.

(c) "A" WEIGHTED SOUND LEVEL shall mean the total sound level in decibels of all sound as measured with a sound level meter with a reference pressure of 20 micro-pascals using the "A" weighted network (scale) at slow response. The unit of measurement shall be defined in decibels (dB).*

(d) COMMERCIAL PROPERTY shall mean a parcel of real property which is developed and used either in part or in whole for commercial purposes.

(e) CUMULATIVE PERIOD shall mean an additive period of time composed of individual time segments which may be continuous or interrupted.

(f) DECIBEL (dB) shall mean a unit which denotes the ratio between two (2) quantities which are proportional to power: the number of decibels corresponding to the ratio of two (2) amounts of power is ten (10) times the logarithm to the base ten (10) of this ratio.

(g) DWELLING UNIT shall mean a single unit providing complete, independent living facilities for one or more persons including permanent provisions for living, sleeping, eating, cooking, and sanitation.

(h) EMERGENCY MACHINERY, VEHICLE, WORK OR ALARM shall mean any machinery, vehicle, work or alarm used, employed, performed or operated in an effort to protect, provide or restore safe conditions in the community or for the citizenry, or work by private or public utilities when restoring utility service.

(i) FIXED NOISE SOURCE shall mean a stationary device which creates sounds while fixed or motionless including but not limited to residential, agricultural, industrial and commercial machinery and equipment, pumps, fans, compressors, air conditioners and refrigeration equipment.

(j) GRADING shall mean any excavating or filling of earth material or any combination thereof conducted at a site to prepare said site for construction or other improvements thereon.

(k) HEALTH OFFICER shall mean the Health Officer of the City or his duly authorized deputy.

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* Unless otherwise specified, a Noise Level shall be assumed to be an A-weighted Sound Level.

(l) IMPACT NOISE shall mean the noise produced by the collision of one mass in motion with a second mass which may be either in motion or at rest.

(m) INDUSTRIAL PROPERTY shall mean a parcel of real property which is developed and used either in part or in whole for manufacturing purposes.

(n) INTRUDING NOISE LEVEL shall mean the total sound level created, caused maintained or originating from an alleged offensive source in decibels at a specified location while the alleged offensive source is in operation.

(o) LICENSED shall mean the issuance of a formal license or a permit by the appropriate jurisdictional authority, or where no permits or licenses are issued, the sanctioning of the activity by the jurisdiction as noted in public record.

(p) MAJOR ROADWAY shall mean any street, avenue, boulevard, or highway used for motor vehicle traffic which is owned or controlled by a public governmental entity with an average daily traffic flow of 30,000 or more vehicles.

(q) MOBILE NOISE SOURCE shall mean any noise source other than a fixed noise source.

(r) PERSON shall mean a person, firm, association, copartnership, joint venture, corporation or any entity, public or private in nature.

(s) RESIDENTIAL PROPERTY shall mean a parcel of real property which is developed and used either in part or in whole for residential purposes, other than transient uses such as hotels and motels.

(t) SIMPLE TONE NOISE shall mean a noise chacterized by a predominant frequency or frequencies so that other frequencies cannot be readily distinguished and, if measured, shall exist if the one-third octave band sound pressure levels in the band with the tone exceeds the arithmetic average of the sound pressure levels of the two contiguous one-third octave bands by 5 dB for frequency settings of 500 Hertz (Hz) and above, by 8 dB for frequency settings between 160 and 400 Hertz, and by 15 dB for frequency settings less than or equal to 125 Hertz.

(u) SOUND LEVEL METER shall mean an instrument meeting American National Institute's Standard S1.4-1971 or most recent revision thereof for Type 1 or Type 2 sound level meters or an instrument and the associated recording and analyzing equipment which will provide equivalent data.

(v) SOUND PRESSURE LEVEL of a sound, in decibels, shall mean twenty (20) times the logarithm to the base ten (10) of the ratio of the pressure of the sound to a reference pressure, which reference pressure shall be explicitly stated.

(w) VIBRATION shall mean any movement of the earth, ground or other similar surface created by a temporal and spatial oscillation of displacement, velocity or acceleration in any mechanical device or equipment located upon, attached, affixed or in conjunction with that surface.

Section 3. Decibel Measurement Criteria.

Any decibel measurement made pursuant to the provisions of this Chapter shall be based on a reference sound pressure of 20 micro-pascals per square meter as measured with a sound level meter using the "A" weighted network (scale) at slow response

Section 4. Designated Noise Zones.

The properties herein after described are hereby assigned to the following noise zones:

Noise Zone I: All single, double and miltiple family residential properties whether incorporated or unincorporated located at a distance more than 600 feet from a major roadway.

Noise Zone II: All single, double or multiple family residential properties whether incorporated or unincorporated located at a distance equal to or less than 600 feet from a major roadway.

Noise Zone III: All commercial properties whether incorporated or unincorporated.

Noise Zone IV: All manufacturing or industrial properties whether incorporated or unincorporated.

Section 5. Exterior Noise Standards.

(a) The following noise standards, unless otherwise specifically indicated, shall apply to all property with a designated noise zone:

Noise Zone	Type of Land Use	Time Interval	Allowable Exterior Noise Level
I	Single, double or multiple family residential (R1, R2, R3, or R4)	10:00 pm to 7:00 am 7:00 am to 10:00 pm	45 dB 50 dB
II	Single, double or multiple family residential (R1, R2, R3, R4, RA)	10:00 pm to 7:00 am 7:00 am to 10:00 pm	50 dB 55 dB
III	Commercial (C1, C2, C3, etc.)	10:00 pm to 7:00 am 7:00 am to 10:00 pm	60 dB 65 dB
IV	Industrial or manufacturing (M1, M2, M1A, etc.)	Anytime	70 dB

(b) It shall be unlawful for any person at any location within the incorporated (unincorporated) area of the City to create any noise, or to allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person, which causes the noise level when measured on any other property either incorporated or unincorporated, to exceed:

(1) The noise standard for a cumulative period of more than thirty minutes in any hour; or

(2) The noise standard plus 5 dB for a cumulative period of more than fifteen minutes in any hour; or

(3) The noise standard plus 10 dB for a cumulative period of more than five minutes in any hour; or

(4) The noise standard plus 15 dB for a cumulativerperiod of more than one minute in any hour; or

(5) The noise standard plus 20 dB for any period of time.

(c) In the event the ambient noise level exceeds any of the first four noise limit categories above, the cumulative period applicable to said category shall be increased to reflect said ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level.

(d) Each of the noise limits specified above shall be reduced by 5 dB for impact or simple tone noises, or for noises consisting of speech or music, provided however that if the ambient noise level exceeds the resulting standard, the ambient shall be the standard.

(e) If the measurement location is on a boundary between two different noise zones, the lower noise level standard applicable to the noise zone shall apply.

(f) If the intruding noise source is continuous and cannot reasonably be discontinued or stopped for a time period whereby the ambient noise level can be determined, the measured noise level obtained while the source is in operation shall be compared directly to the allowable noise level standards as specified respective to the measurement location's designated land use and for the time of day the noise level is measured.

(1) The reasonableness of temporarily discontinuing the noise generation by an intruding noise source shall be determined by the Health Officer or his duly authorized deputy for the purpose of establishing the existing ambient noise level at the measurement location.

(g) The noise from "cutouts" or inadequate mufflers or defective equipment, perceptible without instruments, on any motor vehicle shall be prohibited.

Section 6. Interior Noise Standards.

NO STANDARD RECOMMENDED

Section 7. Special Provisions.

The following activities shall be exempted from the provisions of this Chapter:

(a) Activities conducted on public parks, public playgrounds and public or private school grounds including but not limited to school athletic and school entertainment events.

(b) Occasional outdoor gatherings, public dances, shows, and sporting and entertainment events provided said events are conducted pursuant to a permit or license issued by the appropriate jurisdiction relative to the staging of said events.

(c) Any mechanical device, apparatus or equipment used, related to or connected with emergency machinery, vehicle, work or warning alarm or bell provided the sounding of any bell or alarm on any building or motor vehicle terminates its operation within 30 minutes in any hour of its being activated.

(d) Noise sources associated with or vibration created by temporary construction, oil or gas drilling, repair, remodeling or grading of any real property or during authorized seismic surveys, provided said activities do not take place between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or at any time on Sunday or a federal holiday, and provided the noise level created by such activities do not exceed the noise standard of 60 dB plus the limits specified in Section 5(b) as measured on residential property and any vibration created does not endanger the public health, welfare and safety.

(e) All mechanical devices, apparatus or equipment associated with agricultural operations provided:

(1) Operations do not take place between 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday or at any time on Sunday or a federal holiday, or

(2) Such operations and equipment are utilized for the protection or salvage of agricultural crops during periods of potential or actual frost damage or other adverse weather conditions, or

(3) Such operations and equipment are associated with agricultural pest control through pesticide application provided the application is made in accordance with permits issued by or regulations enforced by the ____________ Department of Agriculture.

(f) Noise sources associated with the maintenance of real property provided said activities take place between the hours of 7:00 a.m. and 8:00 p.m. on any day except Sunday, or between the hours of 9:00 a.m. and 8:00 p.m. on Sunday.

(g) Any activity to the extent regulation thereof has been preempted by state or federal law.

(h) Scavenger opdrations such as sanitation pickup shall be exempt provided these activities take place between the hours of 8:00 a.m. and 4:00 p.m. on any day except Sunday.

Section 8. Schools, Hospitals, Churches, Libraries, etc. - Special Provisions

It shall be unlawful for any person to create any noise which causes the noise level at any school, hospital, church or library while the same is in use, to exceed the noise standards specified in Section 5 prescribed for the assigned noise zone in which the school, hospital, church or library is located, or which noise level unreasonably disturbs or annoys patients in a hospital, provided conspicuous signs are displayed in three separate locations within one-tenth (1/10) mile of the institution or facility indicating a quiet zone.

Section 9. Air Conditioning and Refrigeration - Special Provisions

Until January 1, 1980, the noise standards enumerated in Sections 5 and 6 shall be increased 5 dB where the alleged intruding noise source is an air conditioning or refrigeration system or associated equipment which was installed prior to the effective date of the Ordinance.

Section 10. Noise Level Measurement

The location selected for measuring exterior noise levels shall be at any point along the affected property boundary.

Section 11. Vibration

Notwithstanding other sections of this Chapter, it shall be unlawful for any person to create, maintain or cause any ground vibration which is perceptible without instruments at any point on any affected property adjoining the property on which the vibration source is located. For the purpose of this Ordinance, the perception threshold shall be presumed to be more than 0.05 inches per second rms vertical velocity.

Section 12. Proposed Developments

Each Department whose duty it is to review and approve new projects or changes to existing projects that result or may result in the creation of noise shall consult with the Health Officer prior to any such approval. If at any time the Health Officer has reason to believe that a standard, regulation or action or proposed standard, regulation or action of any Department respecting noise does not conform to the provisions as specified in this Ordinance, the Health Officer may request such Department to consult with him on the advisability of revising such standard or regulation to obtain uniformity.

Section 13. Variance Procedure *

The owner or operator of a noise or vibration source which violates any of the provisions of this Chapter may file an application with the Health Officer for a variance from the provisions thereof wherein said owner or operator shall set forth all actions taken to comply with said provisions, the reasons why immediate compliance cannot be achieved, a proposed method of achieving compliance, and a proposed time schedule for its accomplishment. The application shall be accompanied by a fee in the amount of ________ dollars ($_____). A separate application shall be filed for each noise source; provided, however, that several mobile sources under common ownership, or several fixed sources on a single property may be combined into one application. Upon receipt of said application and fee, the Health Officer shall refer it with his recommendations thereon within thirty (30) days to the Noise Variance Board for action thereon in accordance with the provisions of this Chapter.

An applicant for a variance shall remain subject to prosecution under the terms of this Ordinance until a variance is granted.

Section 14. Noise Variance Board

There is hereby created a Noise Variance Board consisting of five (5) members: Two (2) of the members shall be professional engineers, one of whom shall have demonstrated

* This Section and subsequent Sections concerning administrative policies and enforcement are included from the draft regulation drawn up by the National Health Association for the sake of completeness. However, Wyle Research does not wish to claim expertise in these legal aspects of the regulation.

knowledge and experience in the field of acoustics, the other shall be a registered mechanical engineer. One (1) member shall be a physician licensed in this State and qualified in the field of physiological effects of noise; one (1) member a representative of business and industry, and one (1) member a representative of the general public.

The Noise Variance Board shall evaluate all applications for variance from the requirements of this Chapter and may grant said variances with respect to time for compliance, subject to such terms, conditions and requirements as it may deem reasonable to achieve maximum compliance with the provisions of this Chapter. Said terms, conditions and requirements may include, but shall not be limited to limitation on noise levels and operating hours. Each such variance shall set forth in detail the approved method of achieving maximum compliance and a time schedule for its accomplishment. In its determinations, said Board shall consider the following:

1. The magnitude of nuisance caused by the offensive noise.
2. The uses of property within the area of impingement by the noise.
3. The time factors related to study, design, financing, and construction of remedial work.
4. The economic factors related to age and useful life of the equipment.
5. The general public interest, welfare and safety.

Any variance granted by said Board shall be by resolution and shall be transmitted to the Health Officer for enforcement. Any violation of the terms of said variance shall be unlawful.

Members of the Variance Board shall be appointed by and shall serve at the pleasure of the City Council and shall be reimbursed a total of ($________) for each meeting at which an application for variance is heard.

Said Board shall adopt reasonable rules and regulations for its own procedures in carrying out its functions under the provision of this Chapter. Three members shall constitute a quorum and at least three affirmative votes shall be required in support of any action.

The Health Officer, or his appointed representative, shall be a nonvoting ex-officio member of the Variance Board and shall act as Secretary of the Noise Variance Board.

Meetings of the Noise Variance Board shall be held at the call of the Secretary and at such times and locations as said Board shall determine. All such meetings shall be open to the public.

Section 15. Appeals

Within fifteen (15) days following the decision of the Noise Variance Board on an application, the applicant, the Health Officer or any member of the City Council may appeal the decision to the City Council by filing a notice of appeal with the Secretary of the Noise Variance Board. In the case of an appeal by the applicant for a variance, the notice of appeal shall be accompanied by a fee to be computed by the Secretary of the Noise

Variance Board on the basis of the estimated cost of preparing the materials required to be forwarded to the City Council as discussed hereafter. If the actual cost of such preparation differs from the estimated cost, appropriate payments shall be made either to or by the Secretary.

Within fifteen (15) days following receipt of a notice of appeal and the appeal fee, the Secretary of the Noise Variance Board shall forward to the City Council copies of the application for variance; the recommendation of the Health Officer; the notice of appeal; all evidence concerning said application received by the Noise Variance Board and its decision thereon. In addition, any person may file with the City Council written arguments supporting or opposing said decision of the Noise Variance Board, and the City Council may in its discretion hear oral arguments thereon. The City Clerk shall mail to the applicant a notice of the date set for hearing of the appeal. The notice shall be mailed at least ten (10) days prior to the hearing date.

Within sixty (60) days following its receipt of the notice of appeal, the City Council shall either affirm, modify or reverse the decision of the Noise Variance Board. Such decision shall be based upon the City Council's evaluation of the matters submitted to the City Council in light of the powers conferred on the Noise Variance Board and the factors to be considered, both as enumerated in Sections 13 and 14.

As part of its decision the City Council may direct the Noise Variance Board to conduct further proceedings on said application. Failure of the City Council to affirm, modify or reverse the decisions of the Noise Variance Board within said sixty (60) day period shall constitute an affirmance of the Noise Variance Board's decision.

Section 16. Prima Facie Violation

Any noise exceeding the noise level standards for a designated noise zone as specified in Sections 5 and 6 or vibration exceeding the standard as specified in Section 11 of this Chapter, shall be deemed to be prima facie evidence of a violation of the provisions of this Chapter.

Section 17. Violations: Misdemeanors

Any person violating any of the provisions of this Chapter shall be deemed guilty of a misdemeanor and upon conviction thereof shall be fined in an amount not less than twenty-five dollars ($25.00) nor more than two hundred fifty dollars ($250.00) for a first offense, and not less than fifty dollars ($50.00) or more than five hundred dollars ($500.00) for a second or subsequent offense or be imprisoned in the City (County) Jail for a period not to exceed ______ months or by both such fine and imprisonment. Each day such violation is committed or permitted to continue shall constitute a separate offense and shall be punishable as such.

Section 18. Violations: Additional Remedies - Injunctions

As an additional remedy, the operation or maintenance of any device, instrument, vehicle or machinery in violation of any provisions of this Chapter which operation or

maintenance causes or creates sound levels or vibration exceeding the allowable standards as specified in this Chapter shall be deemed and is hereby declared to be a public nuisance and may be subject to abatement summarily by a restraining order or injunction issued by a court of competent jurisdiction.

Any violations of this Chapter is declared to be a public nuisance and may be abated in accordance with law. The expense of such abatement may be by resolution of the City Council declared to be a lien against the property on which such nuisance is maintained, and such lien shall be made a personal obligation of the property owner.

Section 19. Manner of Enforcement

The City Health Officer is directed to enforce the provisions of this Chapter and is hereby authorized and may arrest at his discretion, any person without a warrant when he has reasonable cause to believe that such person has committed a misdemeanor in his presence.

No person shall interfere with, oppose or resist any authorized person charged with the enforcement of this Chapter while such person is engaged in the performance of his duty.

Violations of this Chapter shall be prosecuted in the same manner as other misdemeanor violations of the City Codes, provided, however, that in the event of an initial violation of the provisions of this Chapter, a written notice shall be given the alleged violator which specifies the time by which the condition shall be corrected or an application for variance shall be received by the Health Officer. No complaint or further action shall be taken in the event the cause of the violation has been removed, the condition abated, or fully corrected within the time period specified in the written notice.

In the event the alleged violator cannot be located in order to serve the notice of intention to prosecute, the notice as required herein shall be deemed to be given upon mailing such notice by registered or certified mail to the alleged violator at his last known address or at the place where the violation occurred in which event the specified time period for abating the violation or applying for a variance shall commence at the date of the day following the mailing of such notice. Subsequent violations of the same offense shall result in the immediate filing of a misdemeanor complaint.

Section 20. Delay in Implementation - Fixed Noise Sources

None of the provisions of this Chapter shall apply to a fixed sound source during the period commencing the effective date of this Chapter and terminating ninety (90) days thereafter.

Section 21. Severability

If any provision, clause, sentence, or paragraph of this Chapter, or the application thereof to any person or circumstance, shall be held invalid, such invalidity shall not affect the other provisions or application of the provisions of this Chapter which can be given effect without the invalid provisions or application and, to this end, the provisions of this Chapter are hereby declared to be severable.

SECTION B. The City Clerk shall Certify to the passage of Adoption of this Chapter and to its approval by the City Council of the City of Huntington Beach.

5.0 ENVIRONMENTAL IMPACT REPORT

5.1 Introduction

This Environmental Impact Report (EIR) for the Noise Element has been prepared in accordance with both the "Revised Guidelines for Implementation of the California Environmental Quality Act of 1970" and the California Council on Intergovernmental Relations' (CIR) "General Plan Guidelines" of September 1973.

The EIR should be viewed as a long-range set of policies and principles and as such, it is not always practical to apply each of the seven points in the CEQA with the same degree of specificity that is applied to a specific project. The General Plan environmental analysis takes on a broader scope than the analysis which is done on a specific project which has specific, well-defined limits.

This report is a general analysis of the impact of noise on the community environment. The seven points which are addressed are:

- The Environmental Impact of the Proposed Action
- Any adverse Environmental Effects which Cannot be Avoided if the Proposal is Implemented
- Mitigating Measures Proposed to Minimize the Impact
- Alternatives to the Proposed Action
- The Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity
- Any Irreversible Environmental Changes which Would be Involved in the Proposed Action Should it be Implemented
- The Growth Inducing Impact of the Proposed Action

This EIR is intended to be the first of a series of environmental assessments, with the final assessment made at the project level. The Noise Element is only one facet of the Comprehensive General Plan. The EIR for this Noise Element, therefore, can represent only a partial statement of environmental effects of the General Plan. When all Elements have been completed and the City has a complete General Plan, the individual EIR's will be combined into a comprehensive assessment for the entire community. The following pages detail the Noise portion of that document.

5.2 Program Description

Noise Element

When adopted, the State-mandated Noise Element will become a citywide Element of the General Plan of the City of Huntington Beach. Unless otherwise stated, all source material used in preparing this EIR is contained in the Noise Element Study.

Objectives of the Plan

The Noise Element is designed to serve as an official guide for the identification, mitigation, and regulation of noise within the City of Huntington Beach. It will be used by the Planning Department, City Council, and Major; other environmental agencies; individual citizens and businessmen; and private organizations concerned with noise pollution and the environment. The Plan provides a reference to be used in connection with actions of various public and private development matters as required by law.

The Plan is intended to protect and enhance the environment and the public health, safety, and welfare. Additionally, it is intended to establish uniformity of policy and direction within the local government concerning actions to eliminate or minimize noise. In summary, the objectives of the Plan are:

- To coordinate intergovernmental efforts to abate noise.
- To reduce the impact of noise from all types of aircraft.
- To reduce motor vehicle noise from streets and freeways through proper location and design.
- To reduce noise levels produced by all types of motor vehicles.
- To require acceptable noise levels for future modes of transporation.
- To reduce the impact of railroad noise.
- To reduce the impact of construction and industrial noise.
- To minimize external noises and prevent them from penetrating quieter uses.
- To abate unnecessary outdoor noises.
- To provide the basis for noise evaluation in land use considerations and Environmental Impact Reports.
- To acquaint people with the seriousness of noise pollution and ways they can assist in reducing noise.

5.3 Environmental Setting

Location

Figure 5-1 depicts the area to be influenced by this Element. Including the incorporated City of Huntington Beach, the territory between the City limits and the center line of the Santa Ana River Channel, and the unincorporated Bolsa Chica and Sunset Beach vicinity, this area is designated as the Huntington Beach "Sphere of Influence." Located along the coast of Southern California in the County of Orange, this 18,700 acres is bounded by the Cities of Seal Beach, Westminster, Fountain Valley, and Costa Mesa.

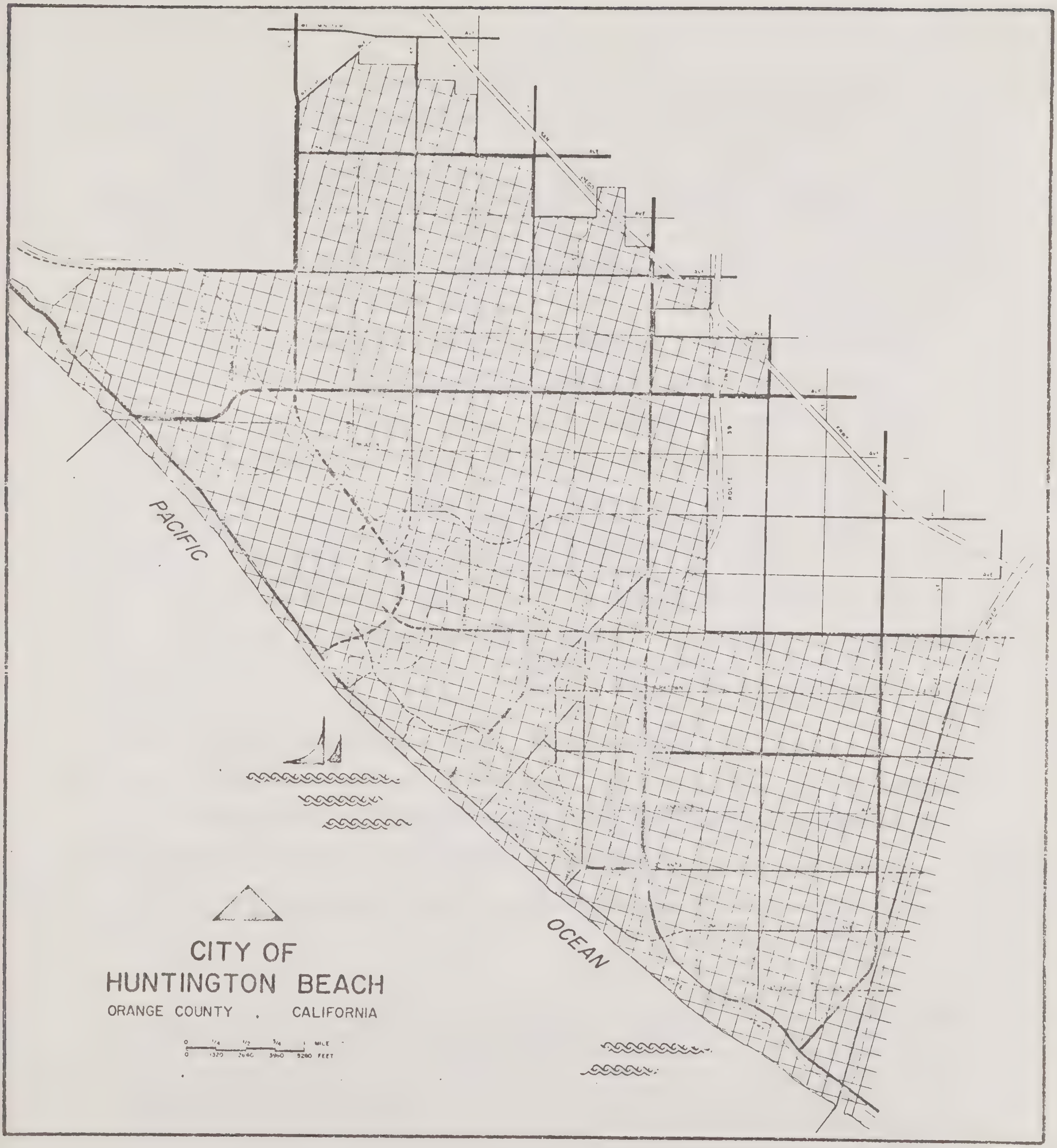


Figure 5-1. Planning Area of Influence

Local Environment

Huntington Beach is a metropolitan area in a metropolitan county, and, as such, its environment — both local and regional — is primarily an urban one. Even in this urban area, however, natural resources remain with the potential for improving the quality of life for all residents of the community.

Resources

The land, water, air, and biological and cultural resources of Huntington Beach have been described elsewhere.

Project Environment

The Noise Element is specifically directed at the local noise environment, including surface transportation, aircraft noise, residential noise, and noise from industrial and commercial facilities and its abatement. Each of these noise sources are treated separately within the body of the Noise Element Report.

5.4 Noise Abatement Program

The policies and programs of the Noise Element are aimed at reducing transportation noise to an acceptable level that does not jeopardize the health and welfare of the citizens of this City. The impacts of the corresponding mitigating measures were evaluated with respect to nine major environmental factors: landform, hydrology, air quality, natural resources, social, economic, urban development, health/safety, and services.

- Landform

Effect: There may be some slight alterations in landform as a result of the policies and programs of this element. This will be due to the limited construction of earth berms or a combination of earth berms and walls for certain new transportation facilities in urbanized areas or where adjacent land use dictates a need for such noise attenuation devices. In rural areas where adequate buffer zones can be provided,

these devices will not be needed. In some instances, it may be deemed appropriate to depress some new transportation facilities in certain noise-sensitive areas.

Technical, environmental, and economic considerations will need to be adequately evaluated on individual projects prior to the implementation of such facilities.

Two policies in the element state that it will be the policy of the City of Huntington Beach to: (1) reduce the present and futur e impact of excessive noise from transportation sources through judicious use of technology, planning and regulatory measures, and (2) encourage the State Department of Transportation to conduct an active highway noise abatement program with scenic/esthetic considerations could create this type of effect. Current noise programs which also could cause such impacts are federal, state, county, and city highway construction programs, as well as the airport development programs which have at various times considered the use of such devices to attenuate noise adjacent to transportation facilities.

Mitigating Measures: The mitigating factor is that any change made to the existing landform will be accompanied by landscaping or planting which has a positive impact from a visual standpoint.

- Hydrology

Effect: The adoption and implementation of the policies and programs of the noise element will have no measurable effect on hydrology.

Mitigating Measures: None required since there are no measurable impacts.

- Air Quality

Effect: This element does not require any expansion of the transportation system. Mass traffic speed reductions and tract route designations are not implied in the policies or programs of the noise element. Therefore, the air quality of the region will not be significantly affected by compliance with the policies and programs recommended in this element.

Mitigating Measures: None required since there are no measurable impacts.

- Natural Resources

Effect: Noise from transportation sources intrudes into every facet of our daily existence. One of the City's most important natural resources, which is slowly being eroded, is the intrusion into the natural quiet areas of the City. A large portion of the City is vacant, recreational or agricultural, including beaches. Much of this area provides a place where a reasonable measure of solitude can be enjoyed.

To construct noise attenuation devices, it will be necessary to expend energy and commit certain natural resources such as soil, rock, sand, cement, wood, and metal to the construction of these various noise control barriers.

Mitigating Measures: This element provides a positive action program, whereby the trend of increased noise can be halted and even reversed. The reduction of transportation noise will enhance the quality of life in both the urbanized and undeveloped areas of the City. This should also enhance the development of wildlife by improving habitat and communication which is necessary to the propagation and survival of certain animal species including man.

- Social

Effect: When noise intrusions occur, man has several choices; he can eliminate the problem by shielding, escaping, or removing the noise source or he can attempt to adapt to his new environment. Adaptations to noise intrusions may adversely affect his health and welfare. The possible adverse effects of man's individual reactions to noise may be compounded in community situations. Most importantly, though, noise may be threatening man's ability to communicate and to comprehend.

If the policies and programs of this element are implemented to alleviate the social effects previously indicated, there may be some displacement of people around the greatest noise problem areas.

Mitigating Measures: The families displaced by these actions would probably relocate to quieter areas which would enhance the socialization processes - communication, education, comprehension, group and family relationships. In addition, these families would receive compensation for their properties and relocation assistance to aid them in the relocation process.

- Economics

Effect: The costs of noise abatement measures are appreciable. For example, the cost to achieve acceptable interior noise levels in homes exposed to aircraft noise varied from $2.10 per square foot to $8.20 per square foot for an increase in noise reduction of about 7 to 17 dB, according to a Wyle Research study conducted for Los Angeles International Airport and published in 1970. An 8-foot wall or earth berm adjacent to a freeway costs approximately $700,000 per mile.

To accomplish the program of noise abatement outlined in the Noise Element of the General Plan will require additional costs to government to fund and staff any needed organizational adjustments as well as to build noise attenuation devices, where deemed necessary, to bring the existing and future noise within acceptable limits.

Enforcement of the programs for noise control will have to be borne ultimately by the taxpayer or the user of the transportation facility through some form of taxation.

Mitigating Measures: The benefits of a noise control program are potentially higher property values, fewer hearing difficulties, improved communication - particularly in group situations - improved health, lower health costs, less litigation, and restoration of a degree of quiet to our urbanized society. Although it is not possible to place an economic value on these benefits, they are worthwhile achievements which, if pursued, would enhance the quality of life in this City.

Certain programs already mandated by the state and federal levels of government are underway which will underwrite some of the costs of noise attenuation devices and require that future vehicles of transportation propagate lower noise levels. The costs for quieter vehicles will ultimately be borne by the consumer who will pay a higher cost in the marketplace for his transportation or higher costs for goods transported by quieter vehicles. To some extent, the enforcement costs will be offset by the fines imposed.

- Urban Development

Effect: The establishment of noise standards in building, subdivision and zoning ordinances, as recommended in this element, could tend to have a restrictive effect on future urban development.

Mitigating Measures: As noise abatement technology progresses, and new quieter vehicles replace the older more noisy models, compliance with these standards can be accomplished more readily and, if staged over a period of years, will lessen this impact while at the same time achieving a gradual improvement in the quality of life in the urban areas through the reduction of noise. In addition, improved noise conditions could enhance existing areas of urban development; thus encouraging redevelopment or upgrading of communities.

- Health/Safety

Effect: The present trend of increasing noise levels is of major concern nationwide, especially in our urban areas where a majority of the population lives. It has been well documented that noise adversely affects humans, both physiologically and psychologically.

With regard to safety, there could be some problems as transportation vehicles become quieter. Quiet vehicles could result in more accidents, since people, particularly the very young and old, may not hear the approaching transportation vehicles as readily.

Mitigating Measures: Since the policies and programs of this element are aimed at reversing the present trend of increasing transportation noise levels, the element itself is a mitigating measure which will improve the health and quality of life for residents of this City.

To mitigate the possible safety problem associated with quieter vehicles, some reeducation will be required. In addition, it may be necessary to place more reliance on visual crossing devices at intersections, school crossings, and railroad crossings.

- Services

Effect: The policies and programs proposed in this element imply the provision of additional services to make the public aware of the effects of noise and certain adjustments in county government to centralize the handling and enforcement of noise-related problems.

An agency or organization may be required to review the noise control program periodically and enforce and police the noise ordinances and regulations. These various functions or realignments of responsibility would probably require additional staff members for the various departments engaged in this type of activity. Eventually an agency or organization may be needed to handle noise-related problems.

Mitigating Measures: Informational services presently available to City government would suffice to inform the public through periodic press releases of actions taken to control noise problems. This will increase the awareness of the public to the problems of noise. Citizen education probably would not increase the demands on our educational system.

The benefits to be derived from a coordinated, comprehensive approach to the noise problem offset any minor interruptions of service or cost of additional staff needed to handle this function.

5.5 Adverse Environmental Effects Which Cannot be Avoided if the Element is Implemented

The adverse environmental effects identified in the previous section are enumerated below:

1. Minor alterations of existing landforms due to construction of noise attenuation devices at various locations where technically feasible.

2. Potential displacement of people around high noise sources to create buffer zones.

3. Additional costs to enforce the noise control programs, construct attenuation devices, and higher costs for goods and services.

4. Minor safety concern because quieter vehicles of transportation will not be heard as readily as existing vehicles.

5.6 Mitigation Measures Proposed to Minimize Impact

For reasons of clarity and simplicity, mitigation measures proposed to minimize the impacts are discussed concurrently with the impacts in 5.4.

5.7 Alternatives

The recommended policies of the transportation noise element are aimed at reducing transportation noise to an acceptable level that does not jeopardize the health, safety, and welfare of the citizens of this City.

In addition to the recommended policies, the following alternatives were considered:

Alternative 1 - Minimum Program

One alternative was aimed at maintenance of the present noise levels associated with the entire spectrum of present and future transportation modes. The implications of this policy set with respect to physical factors is that there would be no

significant effect. Indications are, however, that increased exposure to present noise levels could potentially be detrimental to the health and welfare of the populace. This alternative was not selected because it lacked a sufficiently positive effect on transportation noise.

Alternative 2 - Maximum Program

The aim of another alternative was to eliminate transportation noise within the City to the degree that residents will always experience a condition of quiet. The implications of this are significant and far-reaching, since the measures discussed below would be required to achieve this level of noise reduction.

A noise reduction of this magnitude requires the depressing of all major surface transportation facilities or the construction of attenuation walls, berms, or both. Since major surface transportation facilities also serve as conveyors of surface runoff, any obstruction such as depressed facilities, berms or walls could interrupt normal flow patterns and cause significant flooding problems.

The possible reduction of traffic speeds could increase certain air pollutants. The prohibition of trucks on more highways would tend to increase the concentrations of air pollutants even though the countywide air-pollutant emission total would not increase significantly. Some increase in the total air-pollutant emission could be expected, since trucks would, in some cases, be required to travel longer routes, thus increasing the total vehicle miles traveled.

The scenic and esthetic qualities of the environment could be increased by using buffer zones and additional landscaping between the source and the receiver. However, extensive use of walls, earth berms, and depressed facilities for noise abatement has the potential of causing visual pollution even if designed esthetically and adequately landscaped.

In general, historical and recreational sites would be enhanced because of the increased quiet.

The reduction of transportation noise to the levels implied by these policies would improve the habitat and environment for wildlife. However, the development of extremely quiet vehicles could remove one of the beneficial signals which warn an animal of an oncoming vehicle.

A substantial number of families could be displaced by the construction of depressed highways, earth berms, buffer zones around airports and other transportation facilities. As a result, adequate housing, particularly for low- and middle-income groups, would be more difficult to obtain. This displacement of families would result in the breakup of many neighborhoods and communities.

While the employment would increase for those organizations assigned the task of mitigating noise, the employment would suffer in industry and organizations which produce noise and those industries which are dependent on those which produce noise. The disruption to the economics of the area under such a full abatement program would be catastrophic, unless carried out over many decades.

The increased revenue necessary to support noise abatement programs, higher costs of transportation equipment and the possible decrease in tax base (due to forcing some industries out of existence and the acquisition of additional land area for buffer zones) would result in an imbalance of revenues and expenditures and would probably cause an appreciable increase in tax rate.

The reduction of noise by the substantial amount implied for this policy set would definitely have a beneficial effect on the physical and mental well-being of the populace.

The level of citizen education needed may significantly increase the demand on the educational system, probably at the expense of other needs.

A large agency would be required to police and enforce the noise ordinances. Noise abatement measures such as walls, berms, depressed highways, could impede the maneuverability of fire, police, and emergency vehicles. A strict noise abatement law could impede the ability of these agencies to provide their necessary service.

The depression of major highway systems, walls, berms, vehicle speed reductions, and designation of truck routes could result in loss of access, traffic delays, and an inadequate transportation system which could result in higher prices for goods and services.

This alternative was not adopted because of the extreme disruptive effects that could result to the area's economy, mobility and overall environment if such a program were initiated.

No Project Alternative

Under this alternative, the City would be in violation of Section 65302(g) of the California Government Code and might be liable to legal sanctions, including mandamus (writ issued by a superior court commanding performance of a specified official act or duty) actions and injunctions. The noise environment would not improve. Noise studies, monitoring and environmental impact reports would be conducted independently without uniform standards. For these reasons, this alternative was also rejected.

Proposed Noise Element Alternative

The proposed alternative provides programs to improve the City's noise environment, established City policy on noise abatement and mitigation, and insures coordination of noise studies and monitoring.

The programs provide certain flexibility in their implementation based on the reasonableness of achieving stated objectives. The issuance of variances, time-phasing, and the degree of compliance are all options for consideration by the City. The noise abatement programs lend themselves to a coordinated effort with all other elements to insure the proper beneficial interface.

5.8 The Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

This element will improve the noise environment in this City. The short-term implications of the element will be a relatively small amount of disturbance to landforms,

disruption of social and economic systems, and commitment of energy and materials. The long-term result should be better health and improvement of the quality of life for all residents.

5.9 Irreversible Environmental Changes Which Would be Involved in the Proposed Action Should It be Implemented

Irreversible environmental changes which may be involved in implementing this element are as follows:

- Minor modification of landforms.
- Use of natural resources and energy to construct noise attenuation devices.
- Expenditure of funds to initiate a noise control program and higher costs for certain goods and services when viewed in the context that these expenditures are from a limited source, involve tradeoffs between other desired programs, and are probably not recoverable by those who pay for these higher costs.
- Displacement of residents in high noise areas adjacent to certain transportation facilities in order to provide adequate buffer zones would result in disruption of the social processes of these communities.

5.10 Growth Inducing Impact of the Proposed Action

Several effects may result from the noise plan implementation; these are:

- Imposition of changes in building codes to reduce noise in individual family units may cause a rise n the number of multiple-family dwellings versus single-family dwellings.
- The City may become more centralized to preserve lower noise levels of residential/recreation areas.
- Reduction of noise in the community may cause an influx of new residents contributing inevitably to a further escalation of noise. Population

growth solely due to noise reduction, however, is most unlikely. On the other hand, growth might be slowed if construction activities declined due to increased building costs resulting from stricter building design criteria.

6.0 CONCLUDING SUMMARY

Based upon the community noise measurements performed by Wyle Research in Huntington Beach, it has been determined that the majority of residential locations in the City have background noise levels that may be categorized primarily as "urban residential" with several "very noisy" exceptions resulting from high traffic volumes in certain locations. The single most dominant source of intrusive noise in the community is the traffic along the major thoroughfares. A great deal of this traffic noise has already been reduced by the inclusion of barrier walls along arterials. In that the majority of industrial operations within the City are "light," the noise impact of industrial operations is generally insignificant. One exception to this is the large number of oil well pumps scattered throughout the City.

The 50-site survey (excluding the five oil well pump sites) indicated that the maximum intrusive single event noise sources recorded in Huntington Beach ranged from 50 dB to 85 dB. This is representative of typical community values throughout the United States. The composite L_{dn} contours which are superimposed on the City map also represent typical average conditions based on present and projected traffic flow data. It should be recognized, however, that "typical" conditions rarely persist over time, i.e., they do not take into account such factors as seasonal adjustments in traffic volumes or many other locally peculiar situations. The information contained herein should be interpreted only as flexible guidelines for planning purposes.

In summary, the data presented in this report quantifies the current levels of environmental noise in typical residential areas of Huntington Beach and assesses the present impact of transportation related noise. Mitigating measures are also presented. This information should give city planners and decision makers the necessary perspective and tools for taking action to reduce and control objectionable noise within the City.

Sound or noise knows no boundaries and as such, it must be recognized that many of the problems of noise in Huntington Beach cannot be resolved without a cooperative effort by its neighboring communities, the greater metropolitan area, the

the State and the Federal Government. Through the implementation of the recommended programs, objectives and goals, the City can reduce the near term and long range effects of objectionable noise through proper planning, public education, and control enforcement. The report has provided an overview of the noise problem; it has presented a range of action alternatives which can be implemented by the City to reduce the impact of transportation noise; it has defined a Draft Ordinance; it includes an Environmental Impact Report, and finally it contains a number of procedural techniques which can be applied by City planners in a continuing effort to reappraise the noise problem without the involvement of an acoustics consultant.

APPENDIX A

TERMINOLOGY FOR COMMUNITY NOISE

The following contains some definitions of most of the principal terms used in the description of community noise, particularly around airports. For additional definitions, refer to American Standard Acoustical Terminology, S1.1-1960, American Standards Association, May 26, 1960.

SOUND PRESSURE

The sound pressure at a point is the total instantaneous pressure at that point in the presence of a sound wave minus the static pressure at that point.

LEVEL

In acoustics, the level of a quantity is the logarithm of the ratio of that quantity to a reference quantity of the same kind. The base of the logarithm, the reference quantity, and the kind of level must be specified.

Note 1: Examples of kinds of levels in common use are electric power level, sound-pressure-squared level, and voltage-squared level.

Note 2: The level as here defined is measured in units of the logarithm of a reference ratio that is equal to the base of logarithms.

Note 3: In symbols,

$$L = \log_r (q/q_0)$$

where

L = level of kind determined by the kind of quantity under consideration, measured in units of $\log_r r$

r = base of logarithms and the reference ratio*

q = quantity under consideration

q_0 = reference quantity of the same kind

Note 4: Differences in the levels of two like quantities q_1 and q_2 are described by the same formula because, by the rules of logarithms, the reference quantity is automatically divided out:

$$\log_r (q_1/q_0) - \log_r (q_2/q_0) = \log_r (q_1/q_2)$$

*Throughout this brief on terminology, the base of the logarithm will be 10.

DECIBEL

The decibel is one tenth of a bel. Thus, the decibel is a unit of level when the base of the logarithm is the tenth root of ten, and the quantities concerned are proportional to power.

Note 1: Examples of quantities that qualify are power (any form), sound pressure squared, particle velocity squared, sound intensity, sound-energy density, voltage squared. Thus, the decibel is a unit of sound-pressure-squared level; it is common practice, however, to shorten this to sound pressure level because ordinarily no ambiguity results from so doing.

Note 2: The logarithm to the base the tenth root of 10 is the same as ten times the logarithm to the base 10: e.g., for a number X^2, $\log_{10^{1/10}} X^2 = 10 \log_{10} X^2 = 20 \log_{10} X$. This last relationship is the one ordinarily used to simplify the language in definitions of sound pressure level, etc.

SOUND PRESSURE LEVEL

The sound pressure level, in decibels, of a sound is 20 times the logarithm to the base 10 of the ratio of the pressure of this sound to the reference pressure. The reference pressure is 20 micronewtons per square meter.

ONE-THIRD OCTAVE BAND SOUND PRESSURE LEVEL

The one-third octave band sound pressure level of a sound for a specified frequency band is the sound pressure level for the sound contained within the restricted band.

SOUND LEVEL (NOISE LEVEL)

Weighted sound pressure level measured by the use of a metering characteristic and a weighting A, B, or C, as specified. The weighting employed must be indicated, otherwise the A-weighting is understood. The reference pressure is 20 micronewtons per square meter (2×10^{-4} microbar). Unit: decibel (dB).

STATISTICAL LEVELS

Any of the statistical noise levels is given in terms of the value of the noise level which is exceeded for a stated percentage of the time period during which the measurement was made. The symbol for the noise level which is exceeded y percent of the time is L_y.

The most common measures utilized are L_{99}, L_{90}, L_{50}, L_{10} and L_1, which denote the value of the noise level which is exceeded 99, 90, 50, 10, and 1 percent of the time respectively.

ENERGY EQUIVALENT NOISE LEVEL

The energy equivalent noise level for a stated period is the level of a constant, or steady state, noise which has an amount of acoustic energy equivalent to that contained in the measured noise. The symbol for the energy equivalent noise level is L_{eq}. Its mathematical definition is:

$$L_{eq} = 10 \log_{10} \left[\frac{1}{t_2 - t_1} \int_{t_1}^{t_2} 10^{\frac{NL}{10}} dt \right]$$

where NL is the measured noise level as a function of time and t_1 and t_2 denote the times at the beginning and ending of the measurement period.

RESIDUAL NOISE LEVEL

The residual noise level is the level of the all encompassing unidentifiable noise which remain after all identifiable noises have been eliminated. L_{90} can be used as an estimate of the residual noise level when no steady state identifiable noises are known to be present.

NOISE EXPOSURE AND NOISE LEVEL SCALES

"Noise exposure is the integrated effect, over a given period of time, of a number of different events of equal or different noise levels and durations." The integration may include weighting factors for the number of events during certain time periods in which people are more annoyed by noise (e.g., sleep interference by noise at night).

The various scales for noise exposure or noise level in use throughout the world differ according to the particular method of integration or summation, time period weighting factors, or frequency weightings.

The following summarizes the essential features of and correlation between three noise scales currently used in the United States for noise exposure from aircraft noise. The correlations are necessarily approximate, but are considered valid for interrelating evaluations of aircraft noise exposure at major airports served by current commercial jet aircraft. The definitions used herein are not always the same as those formally given in the source references. In all cases, however, the simplified form given here is an exact equivalent or valid approximation thereto.

Noise Exposure Forecast (NEF)

A method currently in wide use for making noise exposure forecasts utilizes a Perceived Noise Level scale with additional corrections for the presence of pure tones. Two time periods are used to weight the number of flights (Galloway, W.J. and Bishop, D.E., "Noise Exposure Forecasts: Evolution, Evaluation, Extensions and Land Use Interpretations," FAA-NO-70-9, August 1970).

The Single Event Noise Level is defined in terms of Effective Perceived Noise Level (EPNL) which can be specified approximately by:

$$EPNL \doteq PNL_{max} + 10 \log \frac{t_{10}}{20} + F, \quad EPNdB$$

where

PNL_{max} = maximum Perceived Noise Level during flyover, in PNdB,

t_{10} = 10 dB down duration of the Perceived Noise Level time history, in seconds,

F = pure tone correction. Typically, $F \simeq +3$ dB

and

Community Noise Exposure is specified by the quantity, Noise Exposure Forecast (NEF).

For a given runway and one or two dominant aircraft types, the total NEF for both daytime and nighttime operations can be expressed approximately as:

$$NEF = \overline{EPNL} + 10 \log N_f - 88.0$$

where

$\overline{EPNL}$ = energy mean value of EPNL for each single event at the point in question

$$N_f = (N'_d + 16.7\, N_n) \quad \text{or}$$
$$= (15\bar{n}'_d + 150\bar{n}_n)$$

$N'_d, \bar{n}_d$ = the total number and average number per hour, respectively, of flights during the day period 0700 to 2200

$N_n, \bar{n}_n$ = the total number and average number per hour, respectively, of flights during the night period 2200 to 0700

The constant (-88.0) dB includes an arbitrary -75 scale-changing constant and a reference number of daytime flights of 20. The constant 16.7 accounts for the 10-to-1 weighting factor for flights during the 9-hour period.

Composite Noise Rating Method (CNR)

The original method for evaluating land use around civil airports is the Composite Noise Rating (CNR). It is still in wide use by the Federal Aviation Administration and the Department of Defense for evaluating land use around airfields (Civil Engineering Planning and Programming, "Land Use Planning with Respect to Aircraft Noise," AFM 86.5, TM 5-365, NAVDOCKS P-98, October 1, 1964). This noise exposure scale may be expressed as follows:

The Single Event Noise Level is expressed (without a duration or tone correction) as simply the maximum Perceived Noise Level (PNL_{max}) in PNdB.

The noise exposure in a community is specified in terms of the Composite Noise Rating (CNR), which can be expressed approximately as follows:

$$CNR = \overline{PNL}_{max} + 10 \log N_f - 12$$

where

$\overline{PNL}_{max}$ = approximate energy mean maximum Perceived Noise Level (PNL) at a given point

N_f = same as defined for NEF. The actual method for accounting for the number of flights and time periods uses discrete interval correction factors. These have been approximated by the use of the equivalent continuous weighted number of flights, N_f.

Community Noise Equivalent Level (CNEL)

The following simplified expressions are derived from the exact definitions in the report, "Supporting Information for the Adopted Noise Regulations for California Airports." They can be used to estimate values of CNEL where one type of aircraft and one flight path dominate the noise exposure level.

Single event noise is specified by the Single Event Noise Exposure Level (SENEL) in dB and can be closely approximated by:

$$SENEL = L_A(max) + 10 \log t_{ea}, \quad dB$$

where

$L_A(max)$ = maximum noise level as observed on the A-scale of a standard sound level meter

and

t_{ea} = effective time duration of the noise level (on A-scale) in seconds

The effective duration is equal to the "energy" of the integrated noise level (L_A), divided by the maximum noise level, $L_A(max)$, when both are expressed in terms of antilogs. It is approximately one-half of the 10 dB down duration, which is the duration for which the noise level is within 10 dB of $L_A(max)$.

A measure of the average integrated noise level over 1 hour is also used in the California Airport Noise Regulation. This is the Hourly Noise Level (in dB), defined as:

$$HNL \simeq \overline{SENEL} + 10 \log n - 35.6, \quad dB$$

where

$\overline{SENEL}$ = energy mean value of SENEL for each single event,

and

n = number of flights per hour

The total noise exposure for a day is specified by the Community Noise Equivalent Level (CNEL) in dB, and may be expressed as:

$$CNEL = \overline{SENEL} + 10 \log N_c - 49.4, \quad dB$$

where

$$N_c = (N_d + 3N_e + 10N_n)$$

or

$$= (12\bar{n}_d + 9\bar{n}_e + 90\bar{n}_n)$$

$N_d, \bar{n}_d$ = total number and average number per hour, respectively, of flights during the period 0700 to 1900

$N_e, \bar{n}_e$ = total number and average number per hour, respectively, of flights during the period 1900 to 2200

and

$N_n, \bar{n}_n$ = total number and average number per hour, respectively of flights during the period 2200 to 0700

Day-Night Average Sound Level (L_{dn})

A new composite noise scale is currently under consideration by the Environmental Protection Agency for specification of community noise from all sources. Called Day-Night Average Sound Level, it is nearly the same as CNEL except that the weighting for the evening time period in CNEL is eliminated and the "day" extends from essentially 7:00 a.m. to 10:00 p.m., while the "night," with a 10 dB weighting penalty, extends from 10:00 p.m. to 7:00 a.m.

Defined in the approximate manner as above,

$$L_{dn} \simeq \overline{SENEL} + 10 \log N_e - 49.4$$

where

$N_e = N_d' + 10\,N_n$

N_d' = total number of events (flights) during the daytime (0701 to 2200)

N_n = total number of events (flights) during the nighttime (2201 to 0700)

$\overline{SENEL}$ = energy mean value of SENEL for each single event

When defined in the more general way for application to continuous monitoring of community noise, L_{dn} would be given by:

$$L_{dn} = 10 \log \left[\frac{15}{24} \cdot \log^{-1}\left(\frac{\overline{L_d}}{10}\right) + \frac{9}{24} \cdot \log^{-1}\left(\frac{\overline{L_n} + 10}{10}\right) \right]$$

where

$\overline{L_d}$ = energy mean A-weighted noise level during the daytime (0701 to 2200)

$\overline{L_n}$ = energy mean A-weighted noise level during the nighttime (2201 to 0700)

$\log^{-1}$ = denotes an inverse logarithm

Aircraft Sound Description System (ASDS)

The Federal Aviation Administration (FAA), in a recent report FAA-EQ-73-3, "Aircraft Sound Description System – Background and Application," has defined a new system for describing aircraft noise around airports. The system, abbreviated ASDS, is straightforward but differs substantially from the preceding scales. At any point near the airport, exposure to aircraft noise is described in terms of the total amount of time in minutes that sound levels exceed a prescribed A-weighted noise threshold value of 85 dB(A). (This threshold level is roughly equivalent to a Perceived Noise Level of 97 PNdB.)

For example, a point to the side of a single busy runway might be exposed to aircraft noise during takeoff above 85 dB(A) for a total period of (say) 30 minutes a day. This exposure number can be specified for any period of the day desired. No attempt is made with ASDS to use weighting factors to account for greater sensitivity of people to intruding noise at night.

Finally, a composite single number "Situation Index" (SI) can be defined for an airport with the ASDS system which defines the total integrated value of the product of exposure time in minutes above 85 dB(A) and the area exposed. The mathematical expression for this is given by:

$$SI = \sum_{j=1}^{m} \sum_{i=1}^{n} A_{ij} \; N_{ij} \; t_i$$

SI = Situation Index value (acre-minutes)

where

A_{ij} = area (acres) exposed to 85 dB(A) or higher for airplane "j" in event type "i" (event types can be differentiated by operation (takeoff or landing), gross weight, flight path or any other characteristic as desired)

N_{ij} = number of events of type "i" performed by airplane "j"

t_i = approximate time duration appropriate to event type "i"*

m = total number of airplane types

n = total number of event types for each airplane

*The time for which the noise level exceeds 85 dB(A) on the ground for event type "i" – can be approximated as 1/4 minute for each takeoff event and as 1/6 minute for each landing event.

COMPARISON OF COMPOSITE RATING SCALES FOR SPECIFYING COMMUNITY NOISE EXPOSURE

The basic expressions defined above for specifying community noise exposure are summarized below. The weighted number of events (N_f, N_c, or N_e) are defined above.

Noise Exposure Forecast	$NEF = \overline{EPNL} + 10 \log N_f - 88,$	dB
Composite Noise Rating	$CNR = \overline{PNL}_{max} + 10 \log N_f - 12,$	dB
Community Noise Equivalent Level	$CNEL = \overline{SENEL} + 10 \log N_c - 49.4,$	dB
Day-Night Average	$L_{dn} = \overline{SENEL} + 10 \log N_e - 49.4,$	dB

For practical purposes, the following approximate conversions can be used.

$$CNEL \simeq L_{dn} \simeq NEF + 35 \simeq CNR - 38$$

The ASDS system is too new to permit any simple conversions to be made at this time between its index values and the other noise scales.

APPENDIX B

SIMPLIFIED PROCEDURE FOR THE ASSESSMENT OF HIGHWAY TRAFFIC NOISE

INTRODUCTION

A stepwise procedure has been developed by Wyle Research to aid city planners and highway engineers in further evaluating traffic noise environments near selected roads and highways. The method allows for determination of day-night average noise level, L_{dn} (L_{dn} and CNEL may be assumed synonomous) based upon annual average road traffic data. Traffic noise data is provided for analysis of current road traffic and for projections for future time periods. The method allows for determining the position of noise contours of defined reference noise levels into the community and adjusts the locations of the noise contour values for a variety of highway configurations and sideline terrain conditions. The method additionally considers the combined contours which result from highway interchanges.

A detailed worksheet (Figure B-1) is provided with a series of design curves to facilitate utilization of this traffic noise prediction method.

1. Required Input Parameters

   a. Road segment identification (use both road names and milepost marker I.D.).

   b. Lane configuration: number of lanes/typical median width.

   c. ADT

   d. Breakdown of ADT into average hourly flow during daytime (7 AM to 10 PM) nighttime (10 PM to 7 AM) time periods.

If complete statistics are not available, the following has been found to be representative for the majority of the Southern California highway system:

$$F_D \doteq \frac{.87\ ADT}{15}$$

and $$F_N \doteq \frac{.13\ ADT}{9}$$

where F_D, F_N represent the average hourly flows during the daytime and nighttime hours, respectively. This approximation assumes that 87 percent of the traffic occurs during the daytime period and 13 percent occurs at night.

e. Percent of trucks on the highway (% T). If separate breakouts for day and night are not known, the daytime %T should also be used for nighttime.

2. Select the highway noise curve (Figures B-2 to B-5) appropriate for the specific case under consideration. The following parameters should guide selection proper noise curves from Table B-1.

   a. Year of interest - current or future (after 1980).

   b. Highway classification: city streets: major city streets; rural highways; highways and freeways.

   c. Highway lane configuration and median width (select typical median width which most nearly approximates actual road condition; corrections for deviations are applied in Step 3a).

   d. Representative vehicle speed classifications. Note: These curves assume freely flowing traffic conditions.

3. Determination of Day and Night Equivalent Noise Levels

Enter the appropriate highway noise curves selected in Step 2 from the bottom axis at the traffic flow rates corresponding to F_D and F_N. Read up until the curve corresponding to the proper percent trucks (%T) is intersected and then read the day and night equivalent noise levels (L_{eq} day and L_{eq} night, respectively). Insert these two values in the appropriate columns on the worksheet.

Table B-1

Guide to Selection of Appropriate Curves for Analysis of Highway Traffic Noise

Highway Configuration	Typical Speeds: Cars	Typical Speeds: Trucks	Suggested Usage	Figure No. for Appropriate Year: 1973	Figure No. for Appropriate Year: 1995
2 Lanes/0' Median	35	35	City Street	B-2	B-4
2 Lanes/0' Median	45	45	City Street	B-2	B-4
4 Lanes/0' Median	35	35	City Street	B-2	B-4
4 Lanes/0' Median	45	45	City Street	B-2	B-4
2 Lanes/0' Median	55	55	Rural Highway	B-3	B-5
4 Lanes/0' Median	55	50-55	Highway	B-3	B-5
6 Lanes/22' Median	55	55	Freeway	B-3	B-5
8 Lanes/22' Median	55	55	Freeway	B-3	B-5

3a. Adjustments for Deviations in Median Widths

The adjustment factor to correct for differences between the median width of the actual highway and those listed in Table B-1 is small with a maximum of only 1 dB. Therefore, to an accuracy of 0.5 dB, the following corrections are adequate.

If actual median width exceeds that of table by less than 25 feet, no correction; exceeds that of table by 25 to 75 feet, subtract 0.5 dB; exceeds that of table by more than 75 feet, subtract 1 dB.

4. Determination of L_{dn} at 50 Feet

The day-night average level (L_{dn}) may be determined from the day and night equivalent noise levels (L_{eq} day and L_{eq} night).

Figure B-6 has been provided to simplify this procedure. Simply enter the bottom horizontal scale at the value of L_D (L_{eq} day) determined in Step 3 and read up until the curve corresponding to L_N (L_{eq} night + 10 dB) is intersected. Read L_{dn} on the vertical scale by reading directly left of this intersection. This value represents the nominal L_{dn} value at 50 feet from the centerline of the outer traffic lane with no corrections yet applied for highway barriers or side terrain conditions.

Given the nominal L_{dn} value at 50 feet, we must now consider factors which may first modify this value and then which affects its propagation into the community.

5. Highway Grade Correction Factors

Grade correction factors are applied to trucks only. It is further assumed that grade correction factors apply only to upgrades; hence, only one side of a highway receives modification. The downgrade side of the road should be treated as though no grade condition exists. Noise contours will therefore receive a grade adjustment on the upgrade side and not on the downgrade side.

For ease of application, grade severity has been classified as mild (0 to 2 percent), moderate (3 to 5 percent) and severe (greater than 6 percent). No adjustments in truck

noise output are assumed for mild grade conditions. The correction factors for moderate and severe grades depend on the length of the highway segment at this grade. For relatively short grade segments, it is assumed that trucks will maintain their average speed by operating at higher throttle settings; hence, more power output and more noise.[1]

For extended grade segments, it has been found that truck speeds will drop to 35 or 40 mph under severe grade or decrease somewhat less for moderate grades, resulting – in either case – in a decrease in sound output.

The designation of a highway segment as "long" or "short" must be made by observation of the relative truck speeds over it. The net effect of these variations in truck noise output has been related to the total day-night level at 50 feet in Table B-2. These adjustments assume a maximum truck percentage of 10 percent and hence will be somewhat conservative for lesser truck volumes.

Table B-2

L_{dn} Adjustment for Upgrade Conditions

Grade Condition	L_{dn} Adjustment, dB (at 50 Feet) (Upgrade Segment Only – No Correction for Downgrade)
Short, Moderate Grade	+1.5
Short, Severe Grade	+3
Long, Moderate Grade	-1
Long, Severe Grade*	-1.5

*Truck Speed Below 40 mph.

[1] "Fundamentals and Abatement of Highway Traffic Noise - Textbook and Training Course," prepared by Bolt Beranek and Newman, Inc. for the Office of Environmental Policy, Federal Highway Administration, U.S. Department of Transportation, May 1973.

The appropriate grade adjustment factor should be entered on the worksheet under the column headed "Percent Grade."

6. Propagation of Traffic Noise

Once the adjusted value of L_{dn} at 50 feet has been determined, the remaining task is to evaluate the propagation of this noise into the surrounding community. One must first categorize the highway configuration with respect to the sideline terrain as either level (L), elevated (E) or depressed (D). This notation should be entered on the worksheet under the columns headed "Roadway, E, L, D" along with the approximate height or depth in feet of the elevation or depression. A series of design curves are presented in Figure B-7 for the following generalized conditions:

A. Level roadway

B. 20 feet elevated roadway

C. 30 feet elevated roadway

D. 40 feet elevated roadway

E. 30 feet depressed roadway (2:1 sidewall slope)

(This configuration is typical for most highway cuttings - either underpasses or through narrow gaps.)

The letter designation of the sideline characteristic which is most reasonably described by categories A to E above should be entered under the column headed Sideline – Left (Lt) or Right (Rt)."

The distance to the desired L_{dn} noise contour, (e.g., L_{dn} 65) may then be found by first determining the difference (Δ) between the adjusted L_{dn} value at 50 feet and the desired contour value. This value of Δ in dB should then be found along the left vertical scale of Figure B-7. Read directly across until the appropriate propagation curve (A to E) is intersected. Read the distance from the center line of the outer traffic lane to the desired contour value on the horizontal scale directly down from the intersect. (NOTE: It is possible to achieve dual intersections with curves B, C, and D. The intersect corresponding to the maximum distance from the roadway should be used.)

A column on the worksheet headed "Distance to L_{dn} 65" has been provided in which to write the distance to the 65 dB noise contour. Distances to other contours of interest should be entered under the column headed "notes."

The propagation curves presented in Figure B-7 are generally representative of a broad variety of highway configurations. For maximum conservatism in the analysis, curve A should be used. This curve assumes no adjustment for barrier attenuation. The other curves have been derived from the methodology presented in Reference 1. This method has shown good agreement with Wyle field data on traffic noise attenuation by barriers. In those cases in which the generalized highway configurations used in the Wyle analysis do not adequately represent the case at hand, the reader is referred to the methodology referenced above. Attenuation curves for additional highway configurations may then be created by subtracting the barrier attenuation values so derived from Reference 1 from curve A in Figure B-7.

7. Highway Interchanges

A simplified method for the treatment of highway interchanges is presented here. It is felt that the increased complexity involved in analysis of individual ramp traffic is not justified by any improvement in accuracy that might be possible.

The simplified interchange technique essentially involves the logarithmic addition of the noise levels of the individual highways. Thus, the intersection of the 62 dB contours at a road junction produces a composite level of 65 dB. The rules for decibel addition of two or more numbers (i.e., two or more roads at a junction) are illustrated in Table B-3. A basic consideration to recall is that when two noise sources of equal level are added, the net result is increased by 3 dB (hence, 62 + 62 = 65 dB).

This treatment of interchange contour creation is illustrated graphically in Figure B-8. The decibel addition technique may be used to generate a locus of points of equal noise level through which the desired contour may be fitted; however, for most

Table B-3

Decibel Addition Table

Difference (Δ)	Increment (Inc.)	Difference (Δ)	Increment (Inc.)
0	3.00	5.00	1.19
.20	2.91	5.50	1.08
.40	2.81	6.00	.97
.60	2.72	6.50	.88
.80	2.63	7.00	.79
1.00	2.54	7.50	.71
1.20	2.45	8.00	.64
1.40	2.37	8.50	.57
1.60	2.28	9.00	.51
1.80	2.20	9.50	.46
2.00	2.12	10.00	.41
2.20	2.05	11.00	.33
2.40	1.97	12.00	.27
2.60	1.90	13.00	.21
2.80	1.83	14.00	.17
3.00	1.76	15.00	.14
3.50	1.60	20.00	.04
4.00	1.46		
4.50	1.32		

Instructions for Usage:

Determine the difference (Δ) between each set of two levels to be added. Add the corresponding increment (Inc.) to the larger of the two levels.

Example 1. 79, 81 — Δ = 2 dB; Inc = 2.12; Sum = 81 + 2.12 = 83.1 dB

Example 2.

62, 64 — Δ = 2, Inc = 2.12; Sum = 66.1

66.1, 67 — Δ = .88, Inc = 2.6; Sum = 69.6

69.6, 69 — Δ = .6; Inc = 2.72; Sum = 72.3

Total: 72.3 dB

cases, the identification of a single precise contour value at the intersection will suffice. The composite contour lines may then be flared into the individual contours by hand.

L_{DN} DETERMINATION – EXAMPLE APPLICATION

The following example is presented to aid in understanding this stepwise procedure for determination of L_{dn} noise contours of highway traffic noise.

Step 1 – Input Parameters

Given:
- a. Segment ID: Route XX (East-West) from mile post AA to BB.
- b. Lane configuration: 6 lanes, 50 feet typical median.
- c. ADT: 100,000 vehicles/day.
- d. ADT breakdown by day and night flows:

Assume $$F_D = \frac{.87\ (100,000)}{15} = 5800 \text{ veh/hr.}$$

$$F_N = \frac{.13\ (100,000)}{9} = 1444 \text{ veh/hr.}$$

- e. Percent Trucks: 6 percent (day and night).

Step 2 – Traffic Noise Curve Selection

- a. Year of interest: 1973
- b. Highway classification: freeway
- c. 6 lane/50 foot median. Figure B–3 selected as most appropriate (6 lane/22 foot median).
- d. Speed classification: B–3 appropriate for this case.

Step 3 – Determination of L_{eq} for Day and Night Hourly Flow Volumes

From Figure B–3

L_{eq} day (For F_D = 5800, 6 percent T) = 77 dB

L_{eq} night (For F_N = 1444, 6 percent T) = 71 dB

Step 3a – Median Width Adjustments

a. Difference between actual width and that used in Figure B–3
50–22 = 28 feet.

b. Subtract -0.5 dB from values obtained in Step 3:
thus yielding:

L_{eq} day = 77 –.5 = 76.5

L_{eq} night = 71 –.25 = 70.5

Step 4 – L_{dn} at 50 Feet

From Figure B–6

L_D = 76.5

L_N = 70.5 = 10 = 80.5 dB

L_{dn} = 78.5 dB at 50 feet

Step 5 – Grade Adjustment Factors

Assume a 1.5 mile segment in the Eastbound direction at 6 percent upgrade. Thus, from Table B–2, the grade condition may be classified as "long-severe grade" which yields a grade adjustment of -1.5 dB.

Hence: For Eastbound Traffic: L_{dn} at 50 feet = 78.5–1.5 = 77 dB

and For Westbound Traffic: L_{dn} at 50 feet = 78.5 dB

Step 6 – Propagation of Traffic Noise

For our example, we assume the highway is level with respect to sideline terrain, hence curve A is selected from Figure B- 7.

We desire the distance to the L_{dn} 70 and 65 dB contours; thus, the following Table has been constructed to aid in our analysis.

TABLE B-4

COMPUTATION SUMMARY FOR
TRAFFIC NOISE EXAMPLE APPLICATION

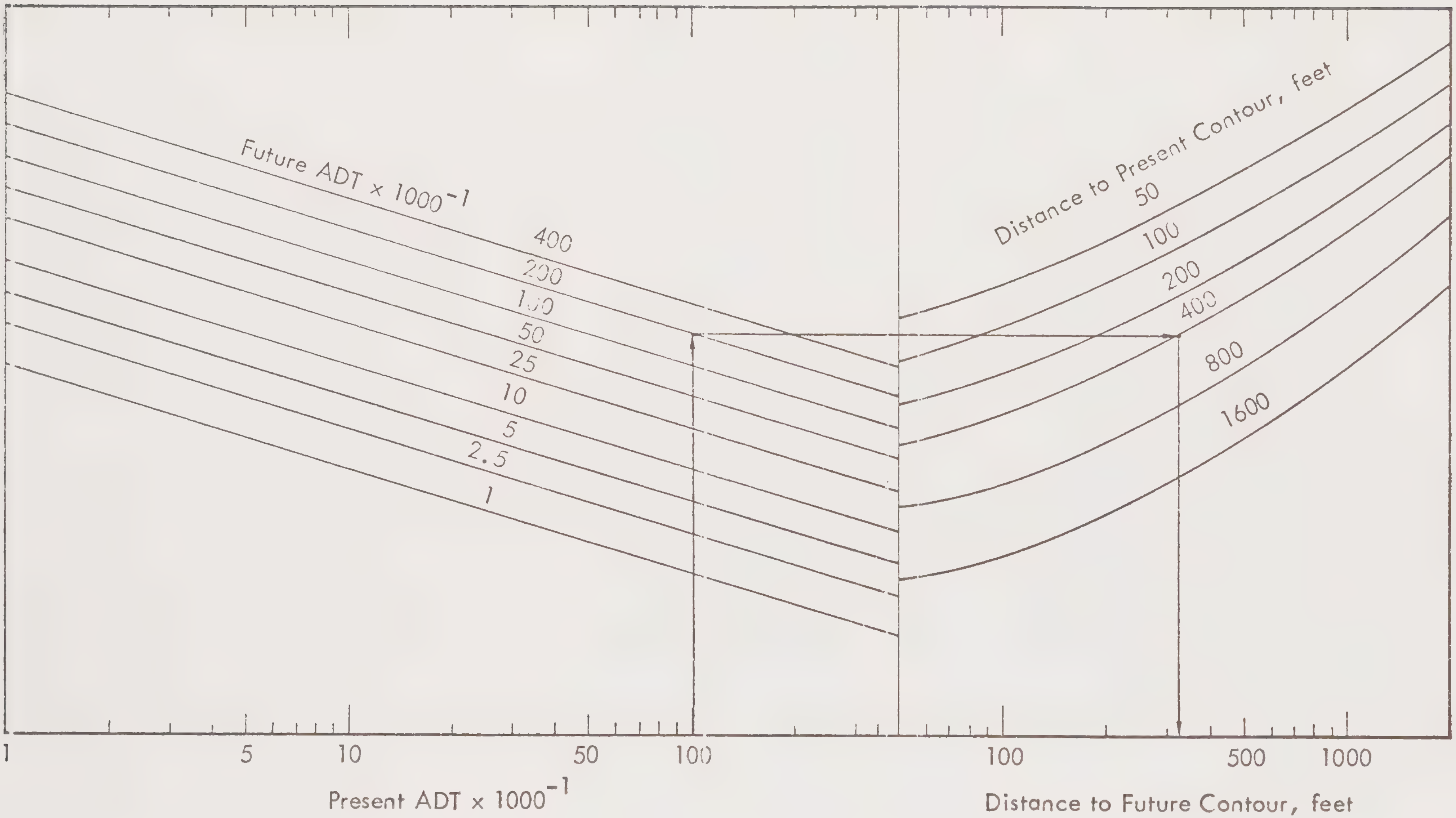
Traffic Direction	Adjusted L_{dn} at 50 Feet dB	Δ Between Ref. L_{dn} Level and Desired Contour Value dB		Distance to Desired Contour from Figure D-7, Curve A Feet	
		$L_{dn} = 65$	$L_{dn} = 70$	$L_{dn} = 65$	$L_{dn} = 70$
Eastbound	77.0	12.0	7.0	400	170
Westbound	78.5	13.5	8.5	500	220

FUTURE CONTOUR ADJUSTMENT

The following simple procedure can be used to adjust the position of the present contours to agree with future conditions (1985 to 1995). Corrections to accommodate the future decrease in car and truck noise level are intrinsic in the analysis. The only input data needed is present Average Daily Traffic (ADT) flow, future ADT and the present distance to the contour under consideration. It is also required that future truck percentage, number of lanes, median width and day/night traffic split be similar to present conditions. Although this procedure assumes some approximation in the transformation between present and future contours, the accuracy is still greater than the ability to predict the precise future traffic definition.

Procedure

Using the future contour adjustment figure below, enter the present ADT on the horizontal scale. Move vertically upward until the curve corresponding to the future ADT is reached. Now move horizontally to the right until the curve designating the distance to the present contour is reached. From this point, drop vertically to read the distance to the future contour on the horizontal scale. This procedure is valid for any L_{dn} contour value chosen.



Example: Input: Present ADT = 100,000
Future ADT = 200,000
Distance to Present Contour = 400 feet

Output: Distance to Future Contour = 330 feet

HIGHWAY NOISE ANALYSIS WORKSHEET

Route ____________

Map Sheet ____________

Ref.	Segment	Lanes/ Median	A.D.T.	Average Hourly Flow		% Truck	L_{eq}, dB		L_{dn} at 50 ft	% Grade	Roadway			Sideline		Dist. to L_{dn} = 65 dB (feet)	Notes
				Day	Night		Day	Night			E	L	D	Lt	Rt		

Prepared By:

Figure B-1 . Worksheet

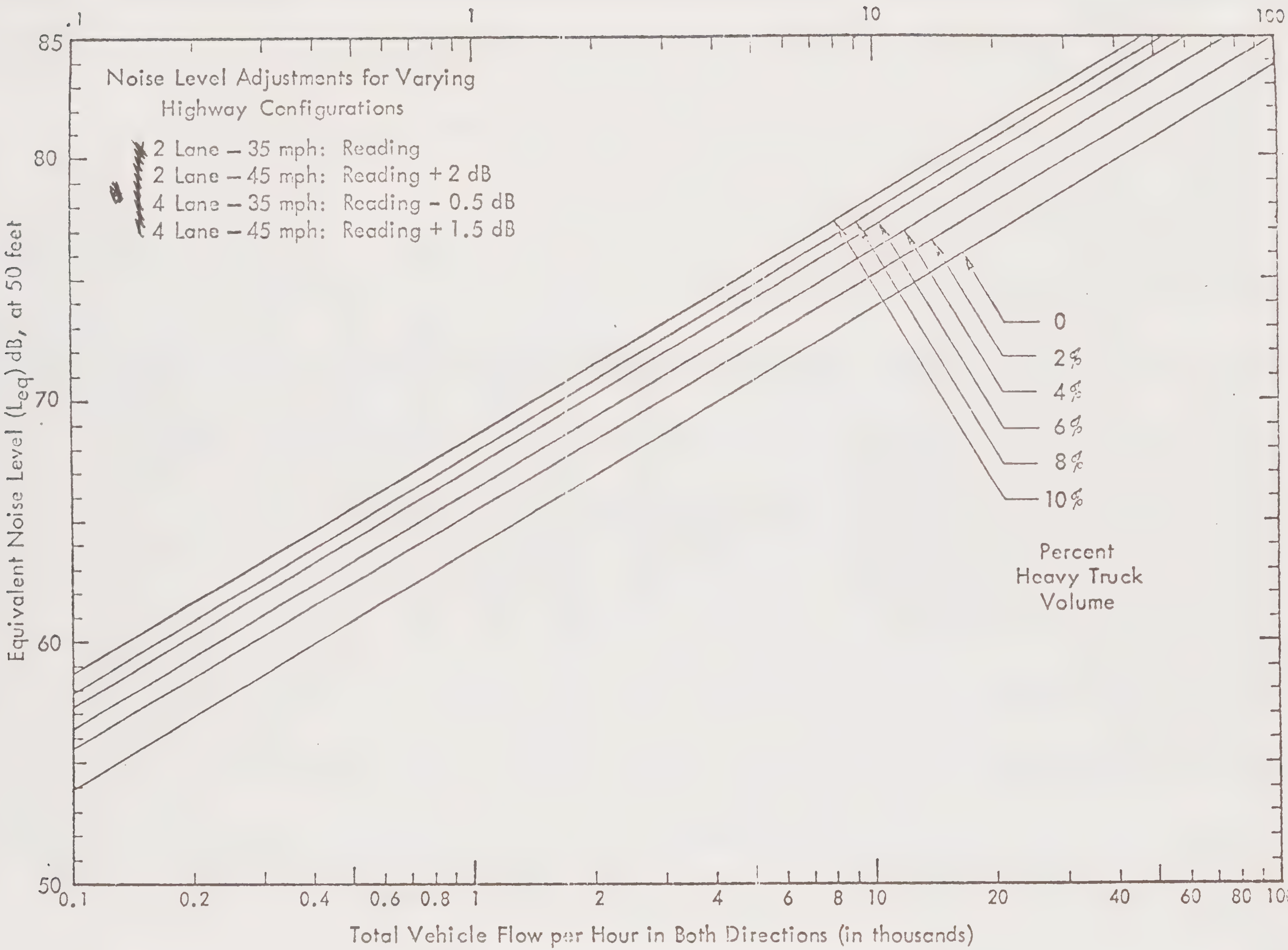


Figure B-2. Traffic Noise from Low Speed Highways – Current Case

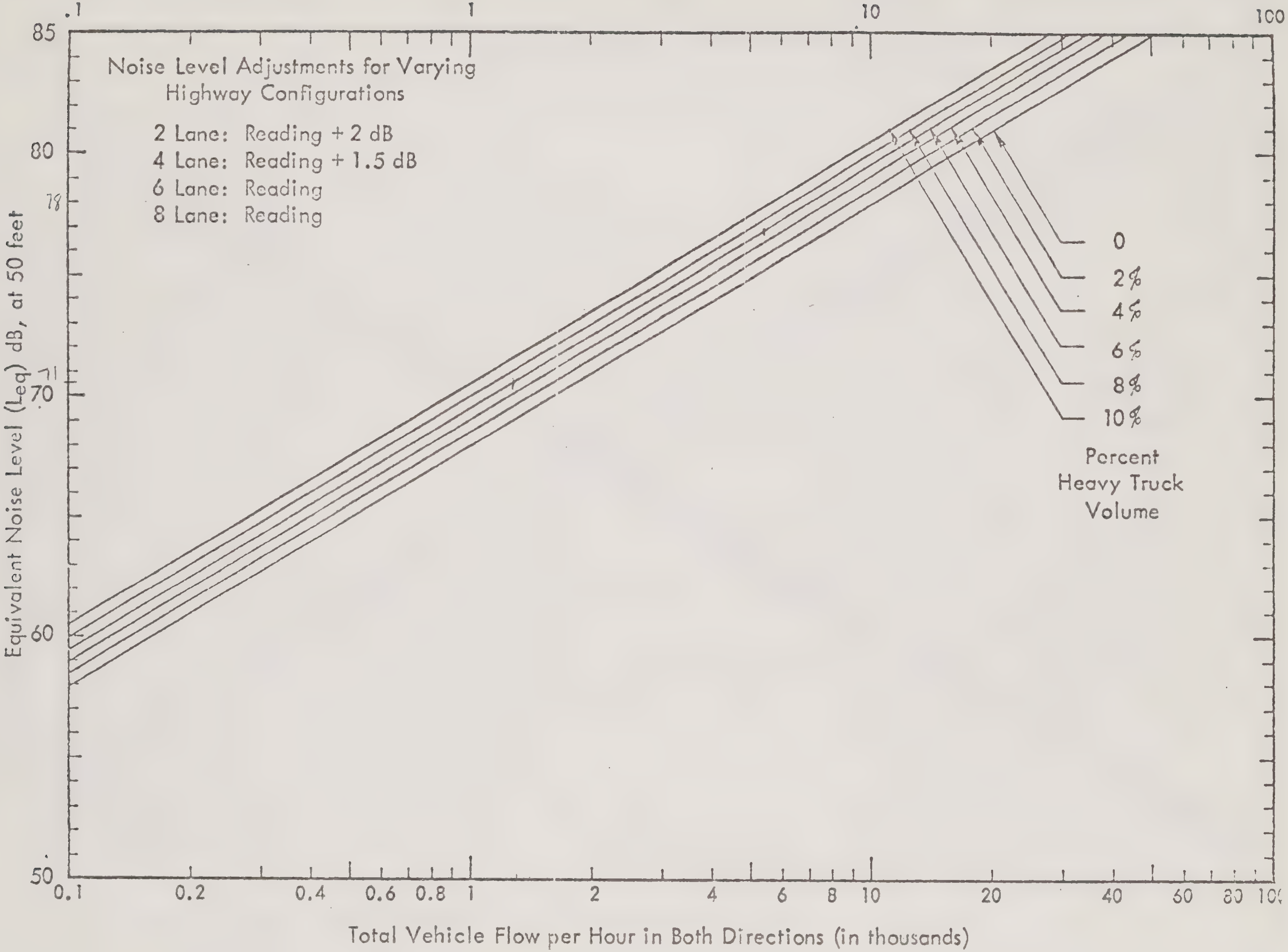


Figure B-3. Traffic Noise from High Speed Highways – Current Case

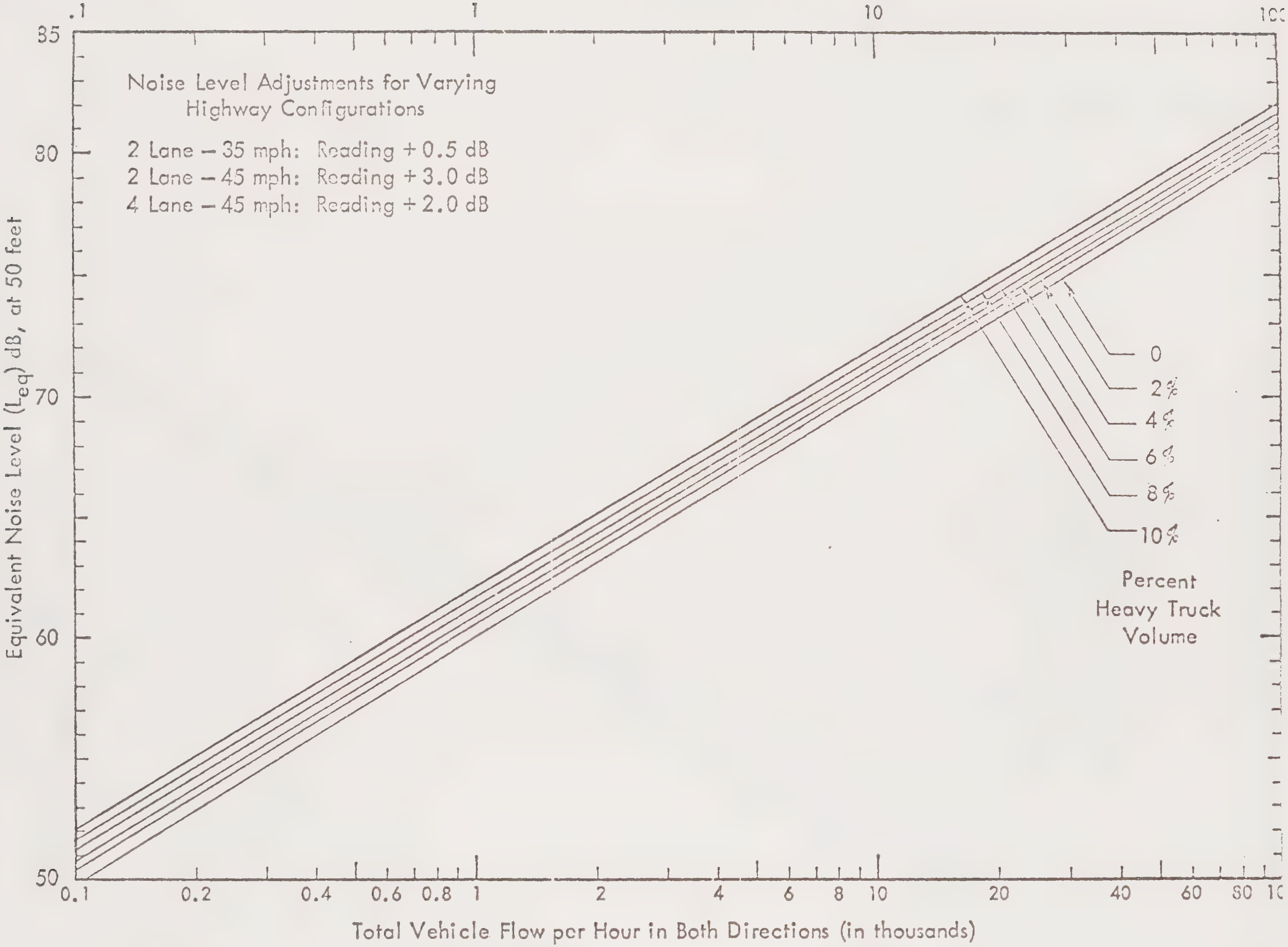


Figure B-4. Traffic Noise from Low Speed Highways – Future Case

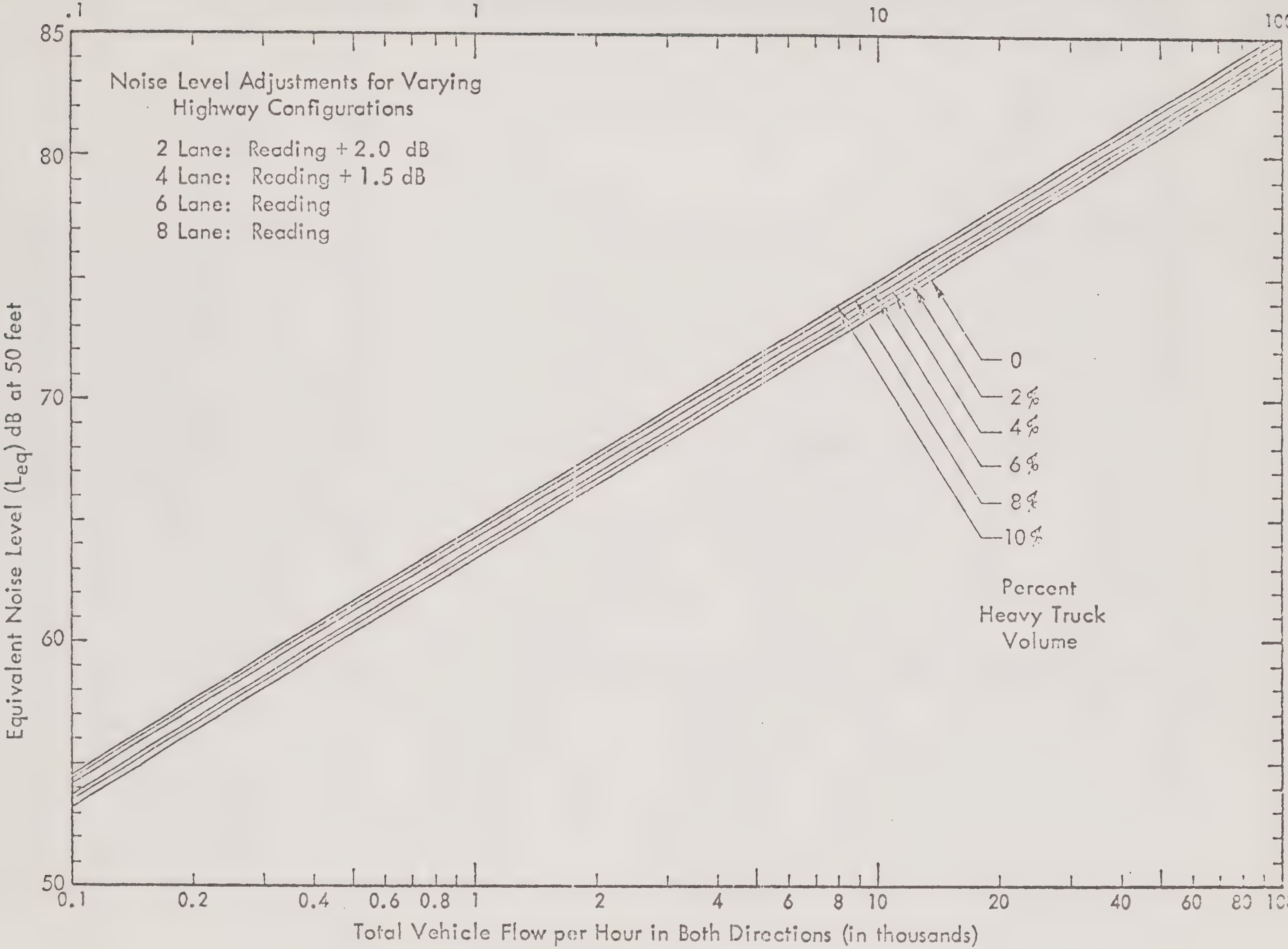


Figure B-5. Traffic Noise from High Speed Highways – Future Case

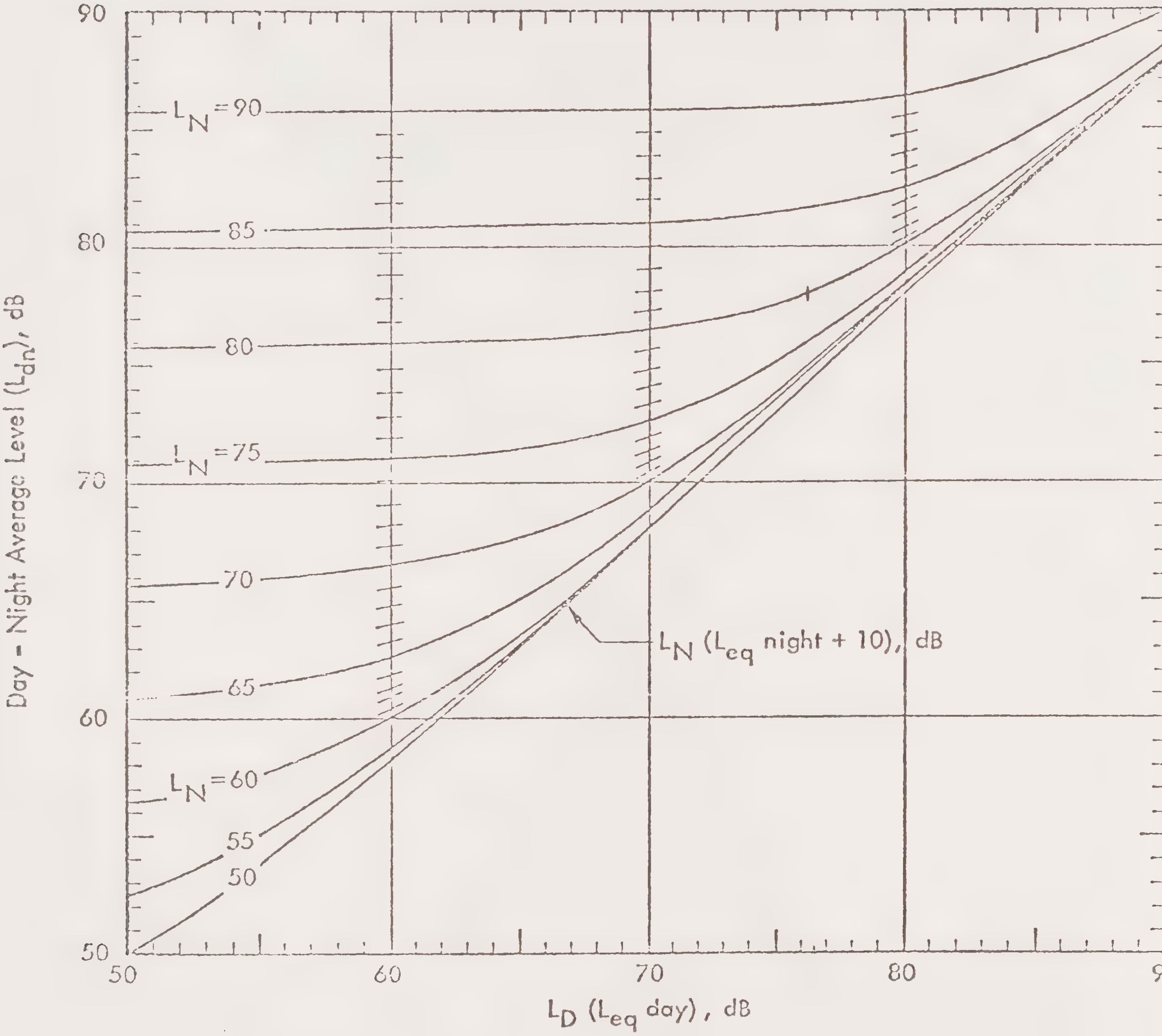


Figure B-6. Determination of The Day-Night Average Level (L_{dn}) Contour Value Given the Day and Night Equivalent Noise Levels.

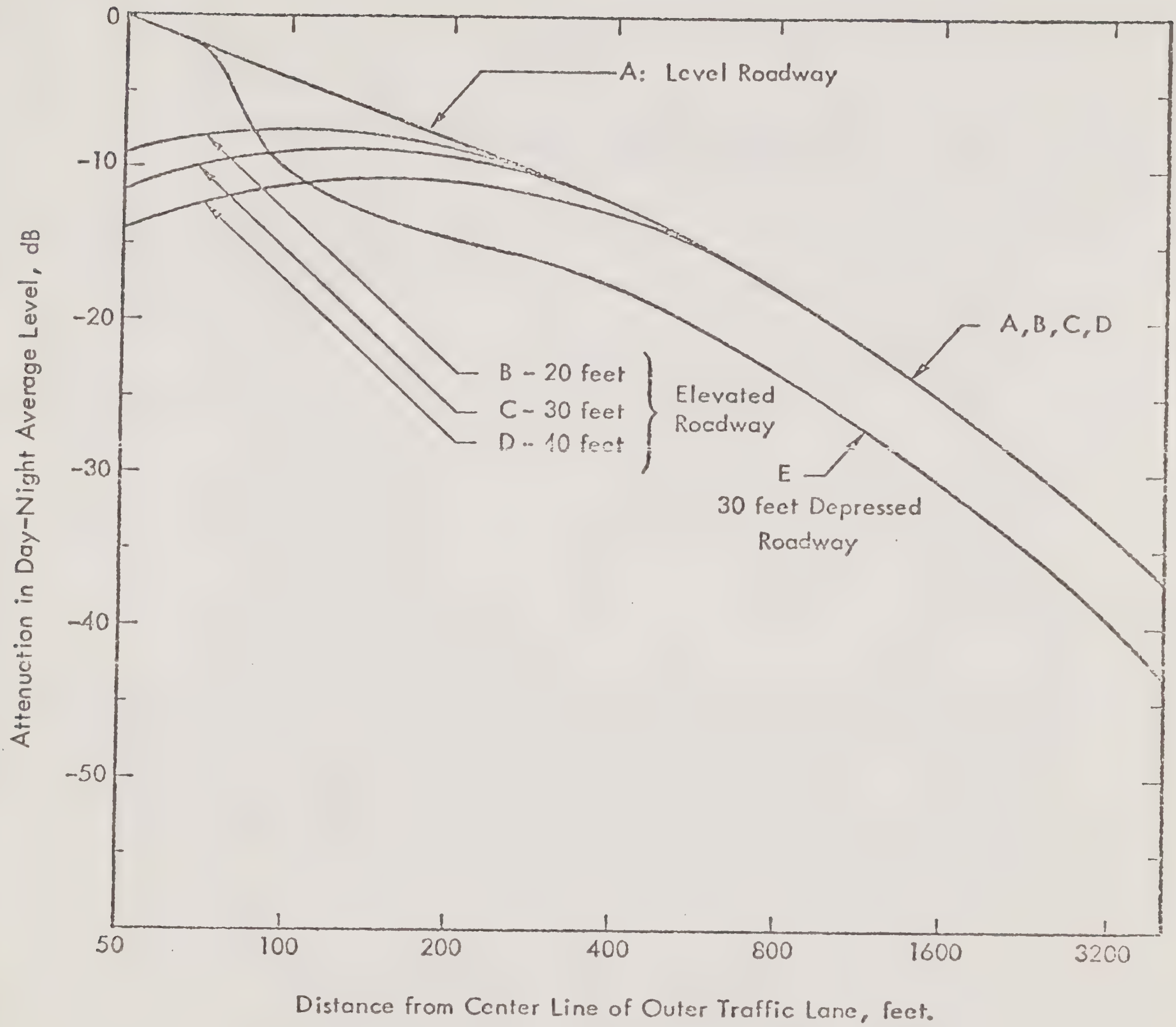


Figure B-7. Propagation of Highway Traffic Noise for Level, Elevated and Depressed Roadway Configurations.

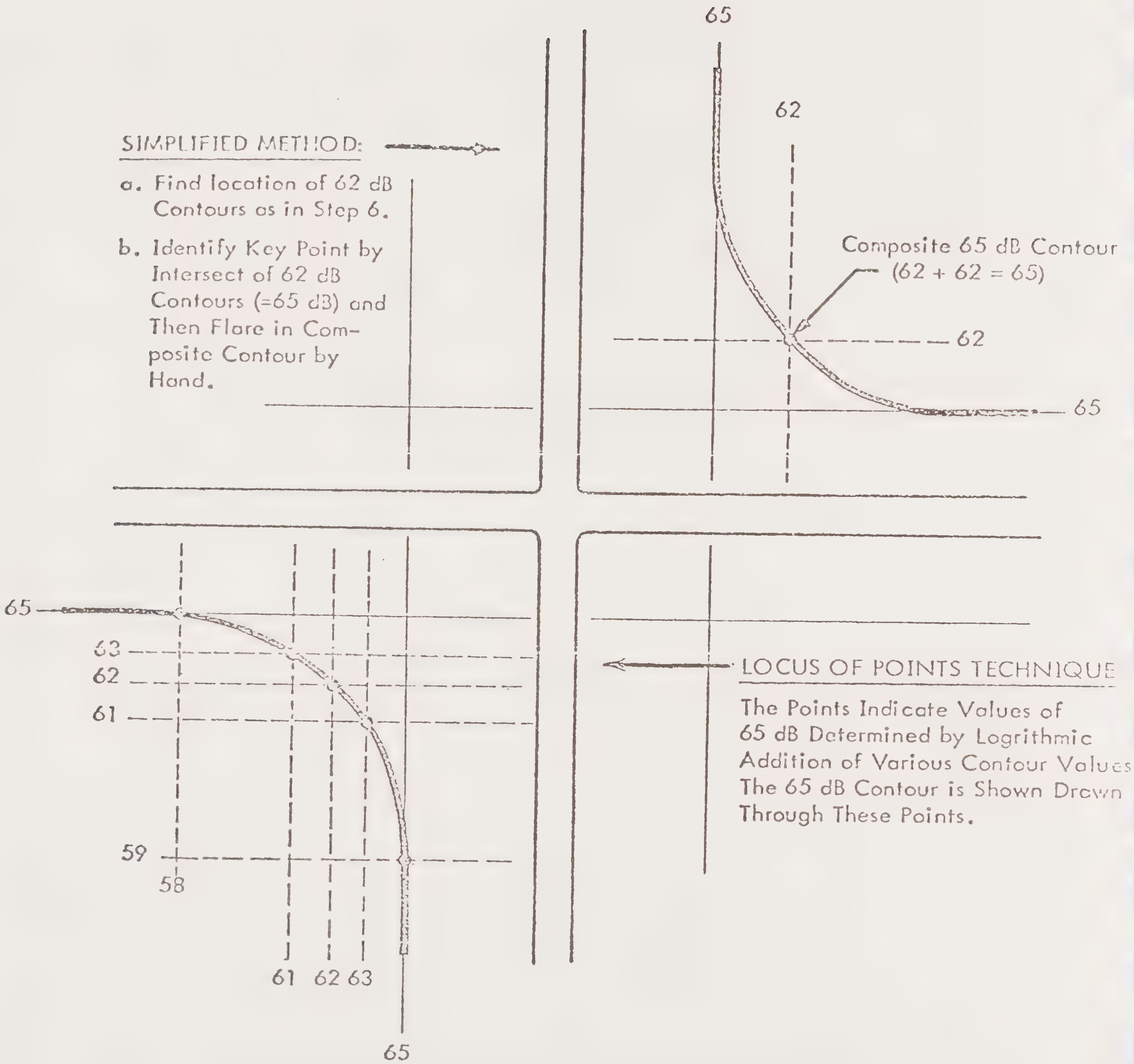


Figure B-8 Methods of Composite Noise Contour Development for Highway Interchanges.

APPENDIX C

SIMPLIFIED PROCEDURE FOR ASSESSMENT OF NOISE EMITTED BY ON-LINE RAILROAD OPERATIONS

INTRODUCTION

This method presents a simplified procedure for the estimation of noise impact created by on-line railroad operations in terms of Day-Night Average Level (L_{dn}) noise contours. L_{dn} noise contours account for the A-weighted noise magnitude of individual occurrences, as well as the time duration of each event. Additionally, they account for the total number of single event occurrences during the 24 hour day and weight these occurrences relative to the time of day in which they occur to account for increased human sensitivity to noise.

The procedure consists of first determining the equivalent number of operations (N) which is equal to the actual number which occurs during the DAY time period (7 AM to 10 PM) plus 10 times the number occurring during the NIGHT time period (10 PM to 7 AM). The factor of 10 relates to increased noise sensitivity during the NIGHT time period. A graphical look-up chart is provided such that the distance to a desired contour value (i.e., 65, 70, 75 dB) may be read directly by entering the chart at the calculated value of equivalent operations, N.

Finally, adjustment factors may be included to account for increased noise levels (and hence, broader reaching noise contours) resulting from tight radius curves, switching frogs, unwelded rail, and bridgework.

A stepwise procedure and example application are as follows:

DIRECTIONS FOR USAGE

Step 1 - Equivalent Number of Operations

Calculate equivalent number of on line operations from the formula:

$$N = N_D + 10\, N_N$$

where N = Equivalent number of operations

N_D = Number of daytime operations occurring between 7 AM and 10 PM

N_N = Number of nighttime operations occurring between 10 PM and 7 AM

Step 2 - Distance to L_{dn} Contour Values

To find the distance to a given contour value, enter Figure C-1 at this value on the left vertical axis and move horizontally to the right until the curve corresponding to the desired value of equivalent number of operations is reached. Move vertically down from that point and read the distance in feet from the the track to this contour value. Contour values so determined do not take into account miscellaneous track irregularities which may increase noise generation at specific locations.

Step 3 - Additional Factors Affecting Noise Output

Table C-1 summarizes the net effect of these additional variables on the L_{dn} noise contours produced by railroad line operations. To include these factors in the analysis, derive an "adjusted contour value" by subtracting the adjustment value determined from Table C-1 from the value of the contour desired. (In the case of multiple occurrence of the items shown in this Table, only the larger of adjustment values should be used.) Enter Figure C-1 at the new adjusted contour value to obtain the distance to the originally desired contour value. (This procedure effectively moves a given contour further from the tracks to account for the increased noise output.

EXAMPLE APPLICATION

The following example should serve to clarify this methodology:

Given: Operations activity over segment of north-south welded mainline track as presented in the table below:

Summary of Example Train Movements

Direction/Type	Number of Daily Operations	
	Day	Night
Freight - Northbound	6	2
Freight - Southbound	4	1
Passenger - Northbound	3	0
Passenger - Southbound	3	0
Total	16	3

The equivalent number of operations (N) are calculated as:

$$N = N_D + 10\,N_N$$

$$= 16 + 10 \times 3 = 46^*$$

Assume we wish to compute the distances to the 70, 65, and 60 dB contours.

Given N = 46, these distances are determined from Figure C-1 and shown below.

Contour Value, dB	Distance from Tracks, Feet
70	115
65	250
60	450

*Note that per direction given in Table
traffic consists of both passenger and freight operations, all operations should be treated as freight operations.

If we now wish to include the effects of track irregularities over certain segments of the line, for example, presence of a switching frog, the following adjustments are made:

Value of adjustment from Table -1: +4 dB

(Thus the switching frog will increase the noise level by 4 dB)

The effect of this increased noise level on the contour distances is summarized in Table C-1.

Desired Contour Value, dB	Adjustment Factor– from Table 1	Adjusted Contour Value, dB	Distance to Desired Contour Value, feet
70	+ 4	66	220'
65	+ 4	61	400'
60	+ 4	56	730'

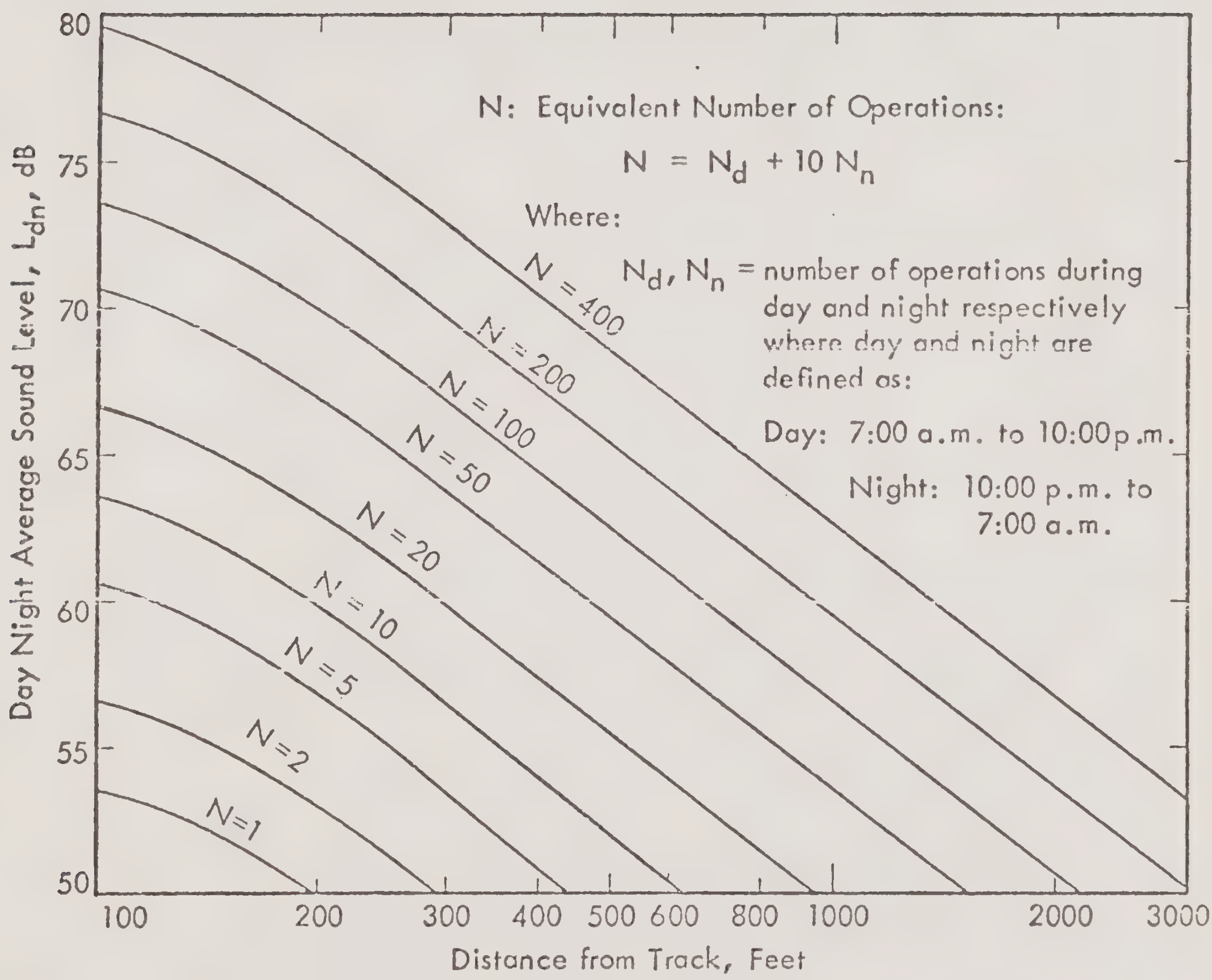


Figure C-1. Distances to Day Night Average Level (L_{dn}) Noise Contours for Railroad Line Operations

Table C-1

Adjustments to L_{dn} Noise Contours

Variables Affecting Noise Output	Correction to Desired L_{dn} Value, dB
1. Passenger trains only (If combination of passenger and freight – assume all freight)	- 1
2. Presence of helper engines (level grade)	0
3. Mainline welded or jointed track	0
4. Low speed classified jointed track	+ 4
5. Presence of switching frogs or grade crossings	+ 4
6. Tight radius curve	
a) Radius less than 600 feet	+ 4
b) Radius 600 to 900 feet	+.5
c) Radius greater than 900 feet	0
7. Presence of bridgework	
a) Light steel trestle	+ 14
b) Heavy steel trestle	+ 5
c) Concrete structure	0

APPENDIX D

SIMPLIFIED PROCEDURE FOR THE ASSESSMENT OF STATIONARY COMMUNITY NOISE SOURCES

INTRODUCTION

The noise characteristics of each stationary community source are unique; hence, a generalized method of analysis is presented herein to allow any such source to be treated on an individual basis.

Input data must be collected which describe the amount of time the disruptive noise is emitted from the source and the A-weighted level of the noise. Under the category of operational information, it is necessary to describe the duration and the frequency over which the noise source operates. Typically, this would be expressed as number of hours of operation during the day and nighttime periods and the days of the week the activity typically occurs. For the second category, that of typical noise level data, one must define the magnitude of the noise emitted by the source during its periods of operation in terms of A-weighted noise level. This level may be defined either at some reference distance away from the source, or may be determined at either the property line of the nearest observer or the property line of the activity which houses the source. Furthermore, most stationary sources encountered do not possess omnidirectional noise emission characteristics; that is, they are louder in one direction than in another. Thus, it may be necessary to define typical noise levels at critical locations at various angles about the source. Additionally, the source may function at different noise levels for certain times during the day in which case these various levels should be identified and the times and hours of operation at each level defined.

A stepwise procedure for the determination of Day-Night Average Sound Level, L_{dn}, noise contour values for stationary sources of community noise follows. A worksheet has been provided to facilitate both input data acquisition and noise exposure assessment.

Stepwise Procedure for Stationary Community Noise Source Evaluation

The objective of this method is to allow the determination of Day-Night Average Level, L_{dn}, noise exposure values at defined locations, given basic data on the A-weighted magnitude of noise levels emitted by the source and the length of time the source operates. The worksheet provided in Figure D-1 along with the nomogram presented in Figure D-2 have been developed to allow systematic computation of L_{dn} noise exposure values.

Step 1

Define measurement locations around the noise source. These positions should be either at the boundary of the property containing the noise source or at the nearest receiver locations. Where feasible, it is recommended that the measurement locations be established at distances from the source at least twice the largest dimension of the noise source to preclude erroneous measurements due to reflections. A space has been provided on the worksheet for a sketch of the source layout and locations of measurement positions.

Step 2

Measure and record typical maximum A-weighted noise levels for those positions defined in Step 1 and record on worksheet. If the source typically emits noise at various levels, the dominant noise levels need to be measured and recorded. A 10 minute sample for each characteristically different time period is usually sufficient to define the noise environment, e.g., the typically high and low traffic flow periods over a 24-hour day. (The measurement technique recommended for peak noise levels as used in The California 701A Traffic Noise Methodology is suitable for this analysis.)

Step 3

Determine the hours of operation of the source at its various levels of noise output and enter these on the worksheet. The total time of operation in minutes of each level of noise output should be determined for the day (7 AM to 10 PM) and nighttime (10 PM to 7 AM) time periods and entered under the columns headed T_D and T_N, respectively.

Sheet 1 of 1

Date: May, 1974

Source ID:

Steam Valve

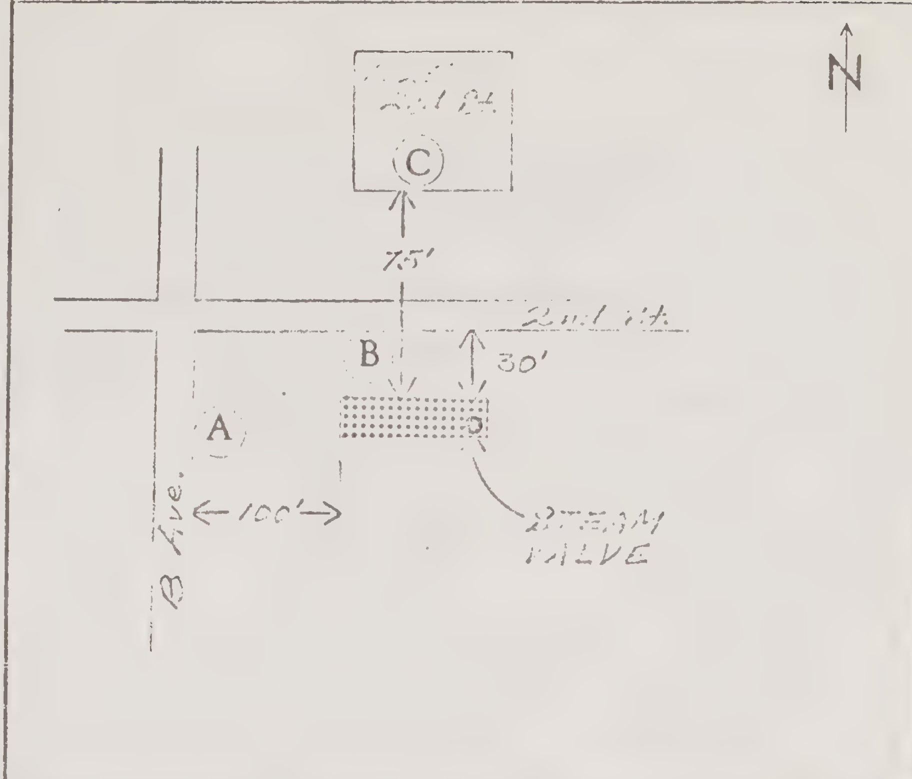
Location:

2nd St. at 'B' Ave.

Comments:

Complaints at residence directly across street from valve at 1025 2nd St.

Sketch of Noise Source Layout and Location of Measurement Positions:



Position		Typical Noise Levels, dBA	Hours of Operation From:	To:	T_{Day} (Min)	T_{Night} (Min)	Component L_{dn}'s	Combined L_{dn}'s
A 100' W.	a)	75	10 AM	1 PM	180	-	72	
at B Ave. W. prop.	b)	75	2 AM	3 AM	-	60		72.3
boundary.	c)	65	3 AM	4 AM	-	60	61	
B 30' No.	a)	90	10 AM	1 PM	180	-	87	
at 2nd St. N. prop.	b)	90	2 AM	3 AM	-	60		87.3
boundary.	c)	80	3 AM	4 AM	-	60	76	
C 75' No.	a)	82	10 AM	1 PM	180	-	79	
1025 2nd St.	b)	82	2 AM	3 AM	-	60		79.3
	c)	71	3 AM	4 AM	-	60	67	
D	a)							
	b)							
	c)							

Figure D-1. Stationary Noise Source Worksheet

Figure D-2. Stationary Noise Source Nomogram. (T_d equals the number of minutes of operation between 7:00 a.m. and 10:00 p.m., T_n equals the number of minutes of operation between 10:00 p.m. and 7:00 a.m., L equals the A-weighted level of the operation at the observer location, and L_{dn} equals the Day-Night Average Sound Level at the observer location.)

Step 4

Determine the value of the Day-Night Average Level, L_{dn}, at each measurement location for each level of noise emitted and total time at this level during the day (T_D) and night (T_N). This is achieved by entering T_D in Figure D-2 (upper vertical scale) and moving horizontally to the right until T_N is reached. Now, move vertically down onto the lower portion of Figure D-2 until the line corresponding to the A-weighted noise level measured in Step 2 is reached. From this point, move horizontally to the left and read the value of L_{dn} on the lower vertical scale. Enter values in worksheet.

Step 5

Determine the composite L_{dn} at each measurement location for the 24-hour day. This task is performed by logarithmically adding each L_{dn} for discrete time intervals over 24-hour day found in Step 4. This addition of L_{dn} values is described as follows:
To combine noise levels expressed in decibels, Figure D-3 has been provided. Determine the "difference" between the first two levels to be added and find this value along the horizontal axis of Figure D-3. Read up until the curve is intersected and read the "increment" on the left vertical axis. The resultant level is the "increment" added to the higher of two values being combined. Subsequent values may also be combined as illustrated in the following Example Application.

Levels to
be Added, dB

77
77 — Difference = 0, Increment = 3
Combined Level = 77 + 3 = 80

75 — Difference = 5
Increment = 1.2
Combined Level = 80 + 1.2 = 81.2

82

Difference = .8

Increment = 2.6

Combined Level = 82 + 2.6 = 84.6

Thus: 77 + 77 + 75 + 82 = 84.6 dB

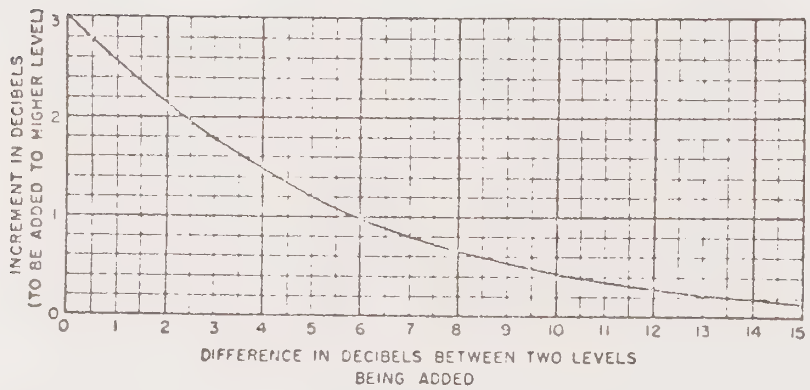


Figure D-3. Chart for combining noise levels.

EXAMPLE APPLICATION (HYPOTHETICAL)

Given Information:

Complaints have been received at 1025 Second Street for noise produced by a steam valve directly across the street from this residence. The valve operates daily from 10 AM to 1 PM and again between 2 AM and 3 AM at one noise level, and then from 3 AM to 4 AM at a reduced noise level.

Step 1 - (See Example Worksheet)

A sketch of the noise source layout was made on the worksheet. Three measurement positions were identified: the West and the North property boundaries of the source and in front of the complaining residence location, 75 feet north of the source.

Step 2

The A-weighted levels of noise emitted were determined using a hand-held sound level meter at the three locations (marked A, B and C on the worksheet). These levels have been entered on the worksheet.

Step 3

The reported hours of source operation were verified and determined to be 180 minutes in the day and 60 minutes at night for the higher noise level, and 60 minutes at night for the reduced level. The hours of operation and the minutes at each level have been entered on the worksheet.

Step 4

Figure D-2 was utilized to determine the component L_{dn} values.

These values have been entered on the worksheet. They represent the noise exposure at specific locations expressed in L_{dn} for each level of noise emitted. The final step is to sum these L_{dn} values at each location to yield a total composite L_{dn} at that location.

Step 5

At each location, there were two component L_{dn} values determined. The decibel addition chart of Figure D-3 was used to combine these values. As may be observed, when the two levels to be combined differ by 10 dB or more, the lower value contributes very little to the total (in this example, about 0.3 dB). Thus, a good rule of thumb is to only consider L_{dn} components within 10 dB of each other.

The final outputs of this example are the composite L_{dn} values at each defined location.

APPENDIX E

NOISE LEVEL DATA SHEETS FOR HUNTINGTON BEACH

The following pages describe the 50 sites included in the Huntington Beach field measurement analysis. The 50 data sheets are preceded by a summary table of measurement locations. The data sheets for the five oil well sites are also included at the end of this appendix (Sites A through E).

Table E-1

Measurement Locations

Site No.	Site Location	Site No.	Site Location
1	Beach Boulevard and Indianapolis	26	Edwards and Ellis (oil pumps)
2	"A" Street near Beach Boulevard and Warner	27	Newland adjacent Edison Power Plant
3	Myrtle and Gentry	28	Tower O Pier along Pacific Coast Highway
4	Brookhurst at Stonybrook	29	Bikini Lane and Tana Street
5	Goldenwest and Bolsa Avenue	30	Railroad Crossing on Edinger
6	Bolsa Avenue at Sussex Circle	31	City Yard on Gothard
7	Pacific Coast Highway at Beach Boulevard	32	Northwest of McDonnell Douglas Corporation
8	Warner and Pacific Coast Highway	33	Huntington Central Park
9	Cornell Circle adjacent Springdale	34	Pistol Range on Gothard
10	Gulstrand and Starfire	35	Police Heliport on Gothard
11	School Property across from new Civic Center	36	County Transfer Station on Gothard
12	Warner and Goldenwest	37	Newland and Edison at Animal Shelter
13	Warner east of Springdale	38	Along Pacific Coast Highway at the Shell Boat Dock
14	Garfield at Edison - maintenance yard	39	Goldenwest between Betty Drive and Ford Drive
15	Beach Boulevard and Edinger	40	Patterson Street
16	The Broadway Store in Huntington Center Mall	41	Murdy Park off Goldenwest
17	Fire Station at Lake and Indianapolis	42	Health Point and Glen Fox
18	Caliente and Bayshore near Meadow Lark Airport	43	Goldenwest between Betty Drive and Ford Drive (same as Site 39)
19	Huntington Beach Inter-Community Hospital	44	Warner at Meadow Lark Airport Entrance
20	Pacifica Convalescent Home and Hospital Complex	45	15293 Cascade
21	Village Shopping Center at Brookhurst and Garfield	46	9112 Pioneer Street
22	Pleasant View School	47	Figaro Street (Huntington Harbour Area)
23	Leafwood Circle	48	School at McFadden and Andaman Lane
24	Rhine Circle	49	Moontide Circle
25	Junior High School on Sunnycrest	50	Magnolia at Helm

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 1

DATE: 10/9/74

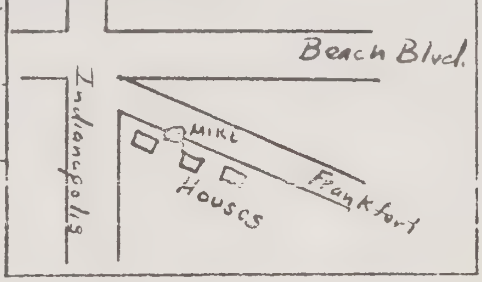
TIME OF DAY 8:00 a.m.

SITE LOCATION: Beach Boulevard and Indianapolis

SITE DESCRIPTION: Residential

Frontage onto Beach Boulevard

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Levels generally remained above 60 dBA

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Freely-flowing traffic on Beach Boulevard emitted typical levels of 64-68 dBA.

Heavy truck acceleration produced 78 dBA.

Huntington Beach police motorcycle on Indianapolis produced 80 dBA+ (off scale)

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 2

DATE: 9/18/74

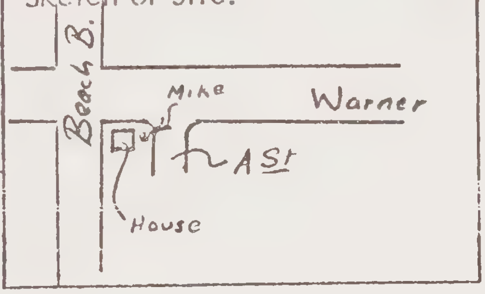
TIME OF DAY 3:30 p.m.

SITE LOCATION: A Street (near Beach Boulevard and Warner)

SITE DESCRIPTION: Residential Property

Near intersection of arterials

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Traffic on Beach Boulevard controlled the residual level at approximately 60 dBA

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Cars on Warner produced 70-75 dBA with trucks sometimes raising levels greater than 80 dBA.

Traffic on Beach Boulevard produced 60-66 dBA with trucks raising levels to 70 dBA

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 3

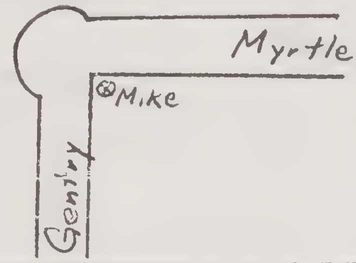
DATE: 10/9/74

TIME OF DAY 5:55 a.m.

SITE LOCATION: Myrtle and Gentry

SITE DESCRIPTION: Residential

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Residual level was controlled by traffic on local arterials ranging from 38 to 42 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): No single events.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 4

DATE: 10/9/74

TIME OF DAY 9:45 a.m.

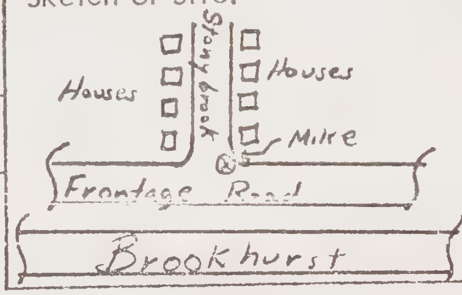
SITE LOCATION: Brookhurst at Stonybrook

"Entrance to Meredith Gardens"

SITE DESCRIPTION: Residential

Adjacent arterial

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Traffic at a distance controlled the residual level at 51 dBA

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Car passbys typically registered 62 to 69 dBA. A Volkswagen registered 73 dBA. Two passbys of heavy trucks each registered 79 dBA.

COMMENTS: Traffic flow was very constant.

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 5

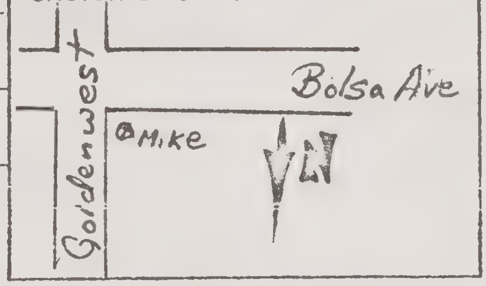
DATE: 9/4/74

TIME OF DAY 12:00 a.m.

SITE LOCATION: Golden West and Bolsa Avenue

SITE DESCRIPTION: Intersection of two arterials

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Stationary traffic at the intersection controlled the residual level ranging from 65 dBA to 70 dBA

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Normal flow of traffic on Golden West or Bolsa produced 75 dBA ±5 dB. Diesel truck acceleration registered 81 dBA.

COMMENTS: All ground surfaces were hard.

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

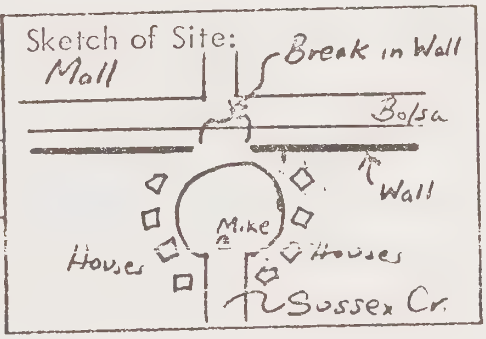
SITE NUMBER: 6

DATE: 9/4/74

TIME OF DAY 12:00 a.m.

SITE LOCATION: Bolsa Avenue adjacent to the circle at the extremity of Sussex Cr.

SITE DESCRIPTION: Residential street adjacent arterial



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): When no discrete cars were heard, the noise level was 48 to 50 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Traffic on Bolsa produced 51 to 54 dBA.

COMMENTS: The noise impact from traffic on Bolsa would be reduced if the break in the wall was closed.

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 7

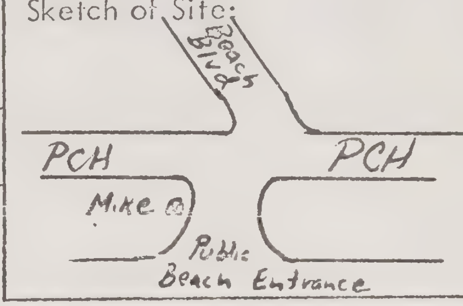
DATE: 10/9/74

TIME OF DAY 8:30 a.m.

SITE LOCATION: Pacific Coast Highway at Beach Boulevard.

SITE DESCRIPTION: Entrance to public beach adjacent highway.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Stationary traffic at intersection lowered the noise level to 54 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Typical passbys on Pacific Coast Highway emitted 65 to 71 dBA.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 8

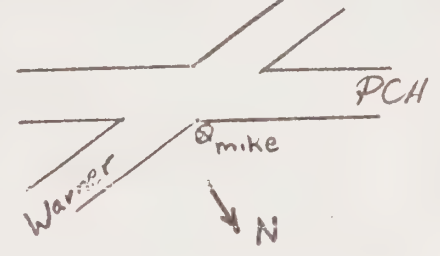
DATE: 9/18/74

TIME OF DAY 11:00 a.m.

SITE LOCATION: Warner and Pacific Coast Highway

SITE DESCRIPTION: Commercial Area
(measurements at sidewalk)

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): 57 dBA was observed when cars were stationary at intersection.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Cars moving on Pacific Coast Highway at the speed limit produced 65-75 dBA. Sports car accelerating produced 80 dBA.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 9

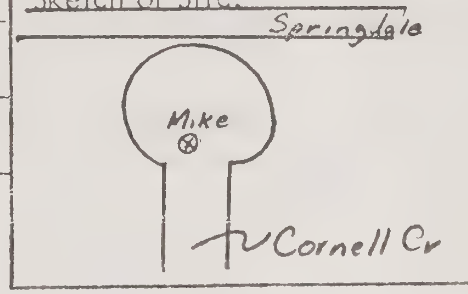
DATE: 9/4/74

TIME OF DAY 1:00 p.m.

SITE LOCATION: Cornell Circle adjacent Springdale.

SITE DESCRIPTION: Residential near arterial (approximately 6 feet wall was placed adjacent to residential property)

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Distant aircraft and distant traffic controlled the residual level. Lowest levels reached 45 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Traffic on Springdale produced 51 dBA to 56 dBA.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 10

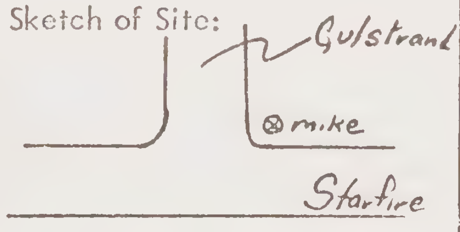
DATE: 10/9/74

TIME OF DAY 5:00 a.m.

SITE LOCATION: Intersection of Gulstrand and Starfire

SITE DESCRIPTION: Residential

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Residual level was controlled by the Edison Power Plant at 37 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): No single events.

COMMENTS: Quiet

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 11

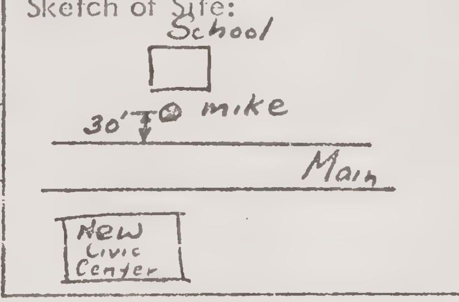
DATE: 10/9/74

TIME OF DAY 4:30 a.m.

SITE LOCATION: School property across from new Civic Center.

SITE DESCRIPTION: School property during inactive time of day.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): The residual was controlled by a fan (for air conditioning) at Civic Center that registered 44 dBA on the school property.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Car passby emitted 61 dBA.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

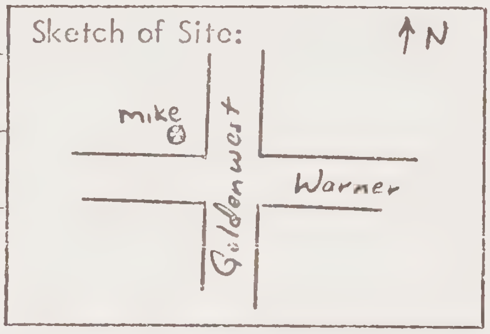
SITE NUMBER: 12

DATE: 9/18/74

TIME OF DAY 12 Noon

SITE LOCATION: Warner and Goldenwest

SITE DESCRIPTION: Intersection at commercial area.



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Low activity at intersection produced 65 dBA, moderate activity produced 70-74 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Truck acceleration registered 82 dBA

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 13

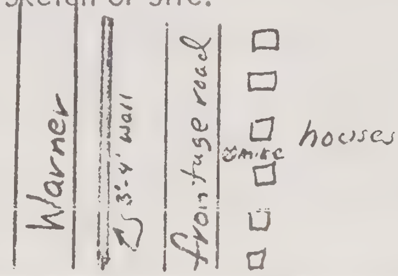
DATE: 9/18/74

TIME OF DAY 11:30 a.m.

SITE LOCATION: On Warner one to two blocks east of Springdale

SITE DESCRIPTION: Residential adjacent arterial (residential property approximately 40 feet from Warner)

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Background traffic and aircraft produced a 52 dBA residual level.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Cars on Warner typically produced 58-62 dBA (up to 70 dBA)

COMMENTS: The 3 foot to 4 foot wall along Warner is too short and too far from the road to decrease noise significantly.

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 14

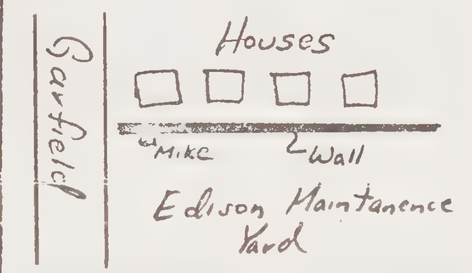
DATE: 10/9/74

TIME OF DAY 4:00 a.m.

SITE LOCATION: Garfield at Edison - maintenance yard

SITE DESCRIPTION: Maintenance yard adjacent residential

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): A fan on the Edison main building controlled the residual level at 48 dBA along the property boundary.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): No single events occurred.

COMMENTS: No activity in maintenance yard.

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 15

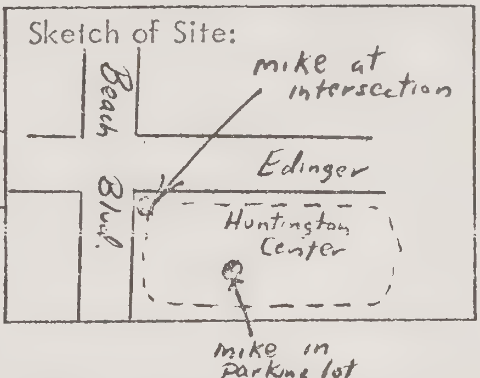
DATE: 9/19/74

TIME OF DAY 1:30 p.m.

SITE LOCATION: Beach and Edinger

SITE DESCRIPTION: Intersection of two arterials at Huntington Center (very busy intersection)

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Levels at intersection varied from 75 to 78 dBA. Levels in the parking lot of Huntington Center typically varied from 57 to 64 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level):

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 16

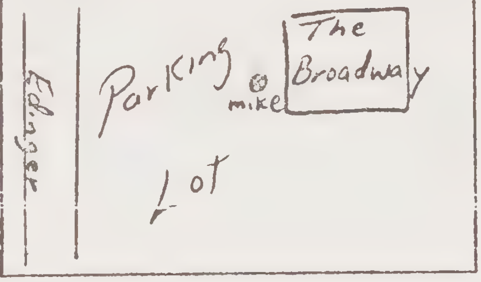
DATE: 9/18/74

TIME OF DAY 12 Noon

SITE LOCATION: The Broadway Store in Huntington Center Mall

SITE DESCRIPTION: In front of large mall near arterial.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Music on the Broadway P.A. system produced up to 54 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Cars driving in front of the Broadway produced 60-72 dBA. These levels were strongly dependent on speed which varied from 5 to 20 mph.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 17

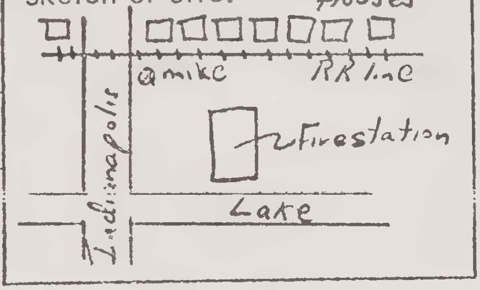
DATE: 10/9/74

TIME OF DAY 7:00 a.m.

SITE LOCATION: Fire Station at Lake and Indianapolis

SITE DESCRIPTION: Fire Station in residential area

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): The residual level was controlled by power line buzz and birds at 45 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Passbys on Lake produced 52-62 dBA.

COMMENTS: No noise from Fire Station.

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

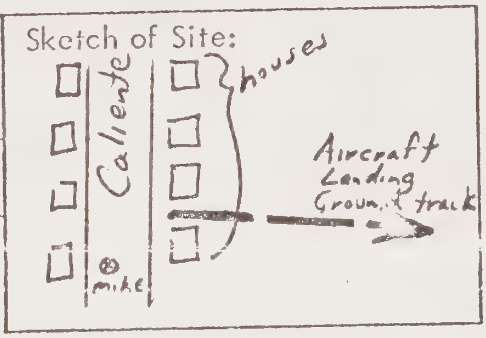
SITE NUMBER: 18

DATE: 9/18/74

TIME OF DAY 10:00 p.m.

SITE LOCATION: Caliente and Bayshore near Meadow Lark Airport

SITE DESCRIPTION: Directly under approach to Meadow Lark Airport in residential area.



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Generally it was a quiet residential area. Birds primarily controlled the residual level producing 45-47 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Small aircraft at a distance produced 58 dBA. Jet aircraft produced 53 dBA. Boeing 727 flyover produced 65 dBA. Powered-edger produced 55-60 dBA. No approach flyovers into Meadow Lark Airport occurred.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 19

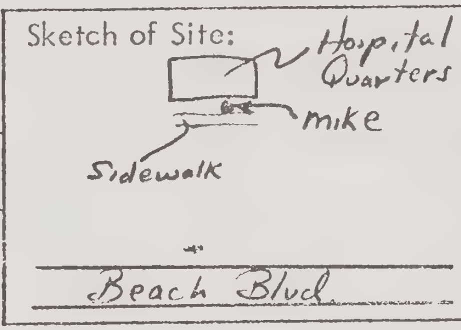
DATE: 10/4/74

TIME OF DAY 5:00 p.m.

SITE LOCATION: Huntington Beach Inter-Community Hospital

SITE DESCRIPTION: Hospital near arterial

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Cars and trucks on Beach Boulevard controlled the residual level which was typically 52 to 56 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): A car in parking lot produced 58 dBA. No discrete passby on Beach Boulevard could be distinguished because of the heavy constant flow of traffic.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 20

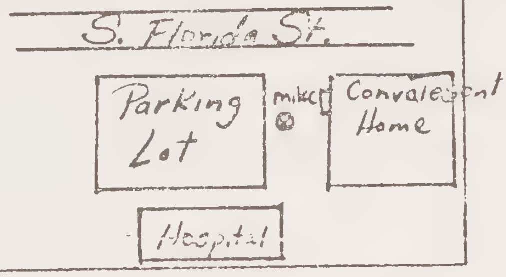
DATE: 10/7/74

TIME OF DAY 6:00 p.m.

SITE LOCATION: Pacifica Convalescent Home and Hospital complex.

SITE DESCRIPTION: Adjacent Collector Street and in vicinity of arterials.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Distant traffic and miscellaneous noise controlled the residual level with lowest levels measuring 46 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Passbys on S. Florida Street produced 58 to 66 dBA.

COMMENTS: No noise was observed to emanate from the hospital complex.

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 21

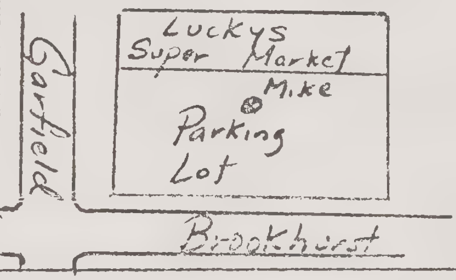
DATE: 10/9/74

TIME OF DAY 10:15 a.m.

SITE LOCATION: Village Shopping Center at Brookhurst and Garfield.

SITE DESCRIPTION: Shopping center parking lot.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Traffic and construction on building across Brookhurst controlled residual at 50 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Truck passby on Brookhurst produced 64 dBA. The P.A. system at the Garden Center could be heard, but not measured because of other noise sources.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 22

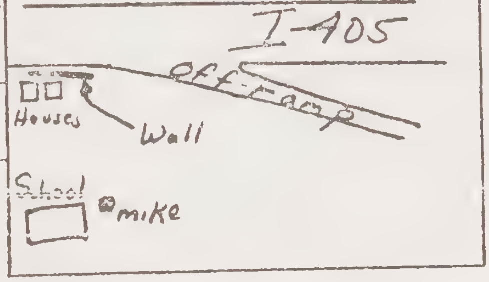
DATE: 10/4/74

TIME OF DAY 11:30 a.m.

SITE LOCATION: Pleasant View School

SITE DESCRIPTION: School in vicinity of freeway.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Residual level was controlled by the freeway at 48 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): No single events.

COMMENTS: Houses, a wall and the off-ramp shielded freeway noise from direct exposure to the school.

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 23

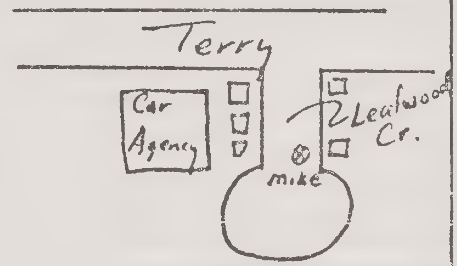
DATE: 9/18/74

TIME OF DAY 3:30 p.m.

SITE LOCATION: Leafwood Circle

SITE DESCRIPTION: Residential near commercial area (adjacent car agency)

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Traffic, children, etc. produced a 49 dBA residual level.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Home construction hammering increased levels over 60 dBA. Air blowing at car agency produced 52 dBA.

COMMENTS: The car agency had a P.A. system which could be heard on Leafwood Circle, but noise level increases could not be measured from the P.A. system.

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 24

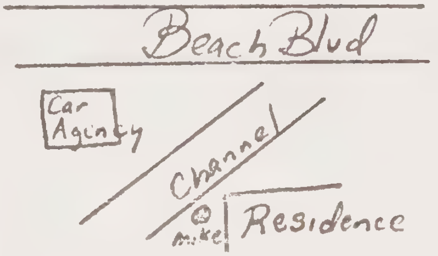
DATE: 9/18/74

TIME OF DAY 4:20 p.m.

SITE LOCATION: Rhine Circle

SITE DESCRIPTION: Residential area near car agency.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Traffic at a distance, aircraft, and miscellaneous noise from car agency produced a 51-54 dBA residual level.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Traffic on Beach Boulevard produced 55-60 dBA. P.A. system at car agency produced 56 dBA.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 25

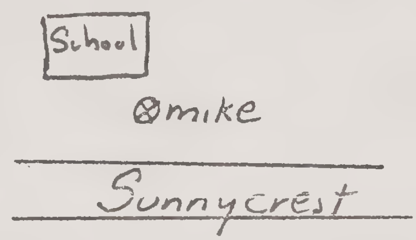
DATE: 9/4/74

TIME OF DAY 12:30 p.m.

SITE LOCATION: Junior High School on Sunnycrest

SITE DESCRIPTION: School in residential area.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Background aircraft noise, background traffic; background helicopter noise controlled the residual level. Lowest readings were 47 to 50 dBA. Up to 53 to 55 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Distant jet produced 50 dBA. A second distant jet produced 56 dBA. A barking dog produced 54 dBA; Neighbor's trumpet increased level by 2 to 4 dBA.

COMMENTS:

WYLE LABORATORIES

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 26

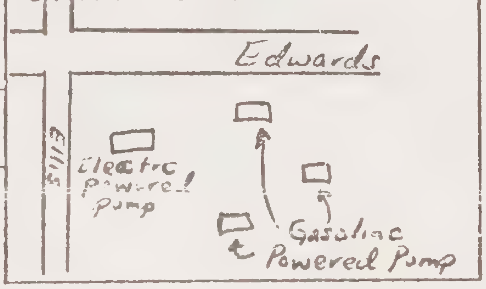
DATE: 10/7/74

TIME OF DAY 3:00 p.m.

SITE LOCATION: Oil pumps at Edwards and Ellis

SITE DESCRIPTION: Open land occupied by oil well pumps.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): The residual level at the intersection of Edwards and Ellis was controlled by the oil pumps at 48 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): A pump powered by an electric motor emitted 56 dBA at 30 feet from the motor with a 6 dB drop per doubling of distance. A pump powered by a gasoline engine emitted 68 dBA at 30 feet from the engine with a 6 dB drop per doubling of distance.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

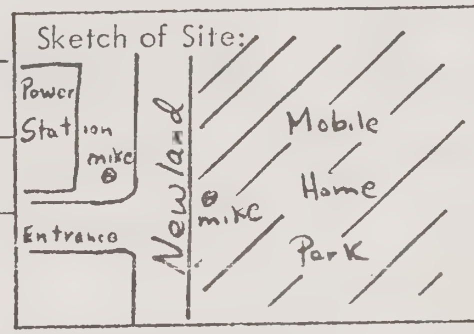
SITE NUMBER: 27

DATE: 10/7/74

TIME OF DAY 4:45 a.m.

SITE LOCATION: Newland adjacent Edison Power Plant

SITE DESCRIPTION: Mobile home park adjacent Power Plant



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): The residual noise was controlled by the Power Plant which registered 56 dBA at the Edison property boundary and 56 dBA at the property boundary of mobile home park.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): No single events.

COMMENTS: The walls on the mobile home property have essentially no effect on the Power Plant noise but may reduce traffic noise on Newland.

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

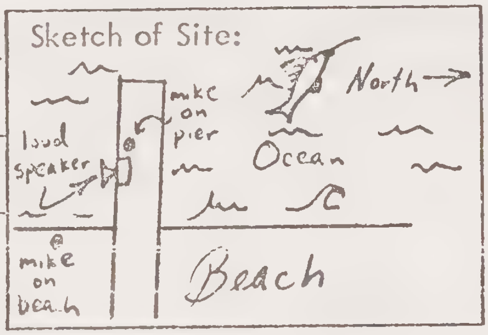
SITE NUMBER: 28

DATE: 9/4/74

TIME OF DAY 3:00 p.m.

SITE LOCATION: Tower O Pier along Pacific Coast Highway.

SITE DESCRIPTION: Populated beach near life guard with loudspeaker.



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Surf breaking and people's voices controlled the residual level. Generally, the noise remained 68 dBA at the lowest levels for both the beach and pier.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Loudspeaker produced 78 dBA to 80 dBA on the pier and 74 dBA to 76 dBA on the beach.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 29

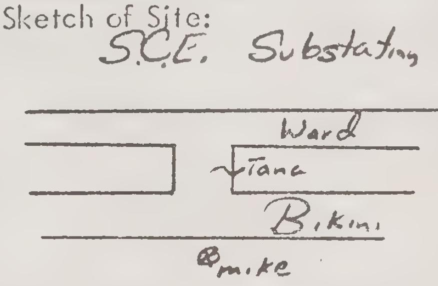
DATE: 10/9/74

TIME OF DAY 5:20 a.m.

SITE LOCATION: Bikini Lane and Tana Street

SITE DESCRIPTION: Residential near Southern California Edison substation

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Residual level was controlled by "humming" at Southern California Edison substation and traffic on I-405 at 47 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): No single events.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 30

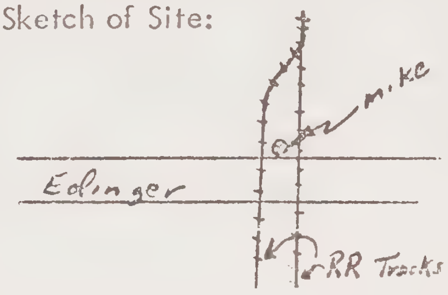
DATE: 9/18/74

TIME OF DAY 2:30 p.m.

SITE LOCATION: Railroad crossing on Edinger

SITE DESCRIPTION: Arterial crossing railroad tracks in commercial area.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Traffic and aircraft controlled the residual level which was 56 dBA ±5 dB.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): A jet flyover produced 62 dBA. Automotibles crossing the railroad tracks revealed a 5 to 10 dBA increase in noise when the car tires passed over the rails.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 31

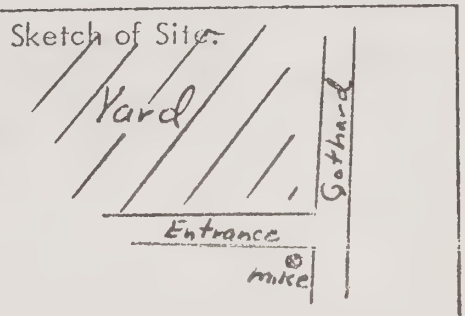
DATE: 9/25/74

TIME OF DAY 2:00 p.m.

SITE LOCATION: City yard on Gothard

SITE DESCRIPTION: City yard property boundary measurement in industrial type area.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Construction equipment controlled residual level at 53 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Aircraft passby produced 58 dBA.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 32

DATE: 9/18/74

TIME OF DAY: 9:30 p.m.

SITE LOCATION: Northwest of McDonnell Douglas Corporation

SITE DESCRIPTION: Residential

Area adjacent McDonnell Douglas Space Systems

Sketch of Site:

DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Construction equipment and mechanical operations on McDonnell Douglas property registered readings of 54-57 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): A dog barking produced 62 dBA.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 33

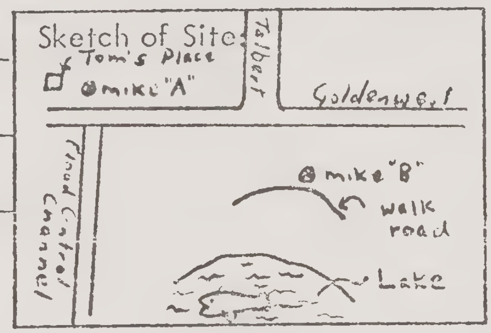
DATE: 10/7/74

TIME OF DAY 2:00 p.m.

SITE LOCATION: Huntington Central Park

SITE DESCRIPTION: Park adjacent arterial (two measurement positions utilized)

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Mike "A": Lowest levels were controlled by distant traffic on Golden West at 51 dBA. Mike "B": Birds, ducks and traffic on Edwards controlled residual levels at 46 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Mike "A": Typical single auto passbys produced 61-64 dBA. Composite levels for groups of cars were 64-66 dBA. A single motorcycle emitted 74 dBA and a heavy truck registered 73 dBA. Mike "B": Aircraft passbys registered 61 and 63 dBA. A heavy truck on Golden West produced 50 dBA.

COMMENTS: Mike "A" should represent highest levels in park. Mike "A" had direct exposure to Golden West. The lower portion of the park (west of Golden West) is greatly shielded from Golden West traffic noise by an embankment and such traffic noise was generally below the residual level.

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 34

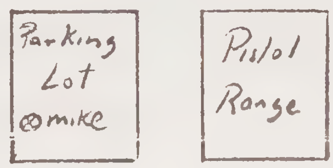
DATE: 10/9/74

TIME OF DAY: 11:00 a.m.

SITE LOCATION: Pistol range on Gothard

SITE DESCRIPTION: Parking lot of pistol range.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Construction equipment in neighboring vicinity registered 55-60 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Pistol emitted 65-70 dBA peak (fast response). Heavy construction diesel registered 63 dBA.

COMMENTS: Although fast sound level meter response was used, gunfire emits a pulse which is too short for the SLM used in this measurement to register accurately.

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 35

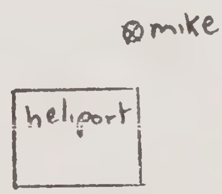
DATE: 10/9/74

TIME OF DAY 11:00 a.m.

SITE LOCATION: Police Heliport on Gothard

SITE DESCRIPTION: Heliport

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Construction equipment in vicinity registered 55-60 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): No helicopter flights occurred.

COMMENTS: Helicoprer data was collected on 9/25/74. Typical passby peak levels were 69 dBA at 500 feet and 64 dBA at 800 feet.

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 36

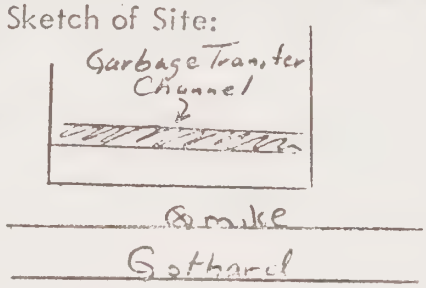
DATE: 10/9/74

TIME OF DAY 10:50 a.m.

SITE LOCATION: County transfer station on Gothard.

SITE DESCRIPTION: Garbage transfer operation.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Miscellaneous operations at transfer station controlled the residual level at approximately 65 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): The garbage compactor shovel created the most noise with levels up to 75 dBA.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 37

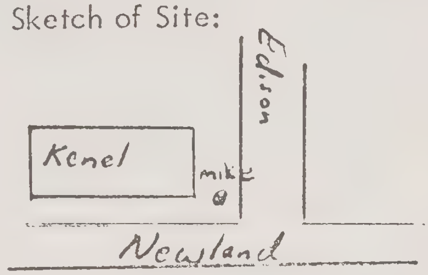
DATE: 10/9/74

TIME OF DAY: 9:00 a.m.

SITE LOCATION: Newland and Edison at animal shelter.

SITE DESCRIPTION: Animal shelter parking lot.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Animals controlled the residual level at 46 to 52 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Single dog barks were up to 60 dBA.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 38

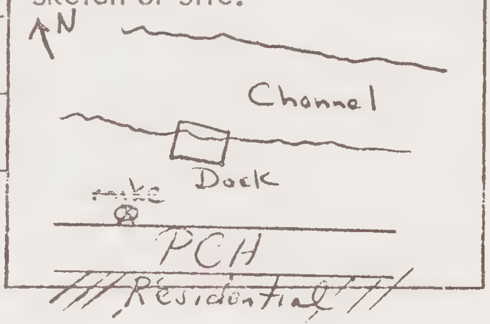
DATE: 10/7/74

TIME OF DAY 11:00 a.m.

SITE LOCATION: Along Pacific Coast Highway at the Shell Boat Dock.

SITE DESCRIPTION: Boat dock near highway and residential area (measurement at sidewalk).

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): The lowest noise level recorded was 56 dBA which was controlled by automobiles on Pacific Coast Highway at a distance. Construction on a house could be heard but emitted a level much less than traffic on Pacific Coast Highway.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Traffic on Pacific Coast Highway typically emitted levels of 72 to 78 dBA for single passbys. A heavy truck emitted 85 dBA. Motor-powered boat, 30 feet plus in length, in the channel emitted levels much less than Pacific Coast Highway and could not be measured.

COMMENTS: There was no activity at the boat dock.

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 39

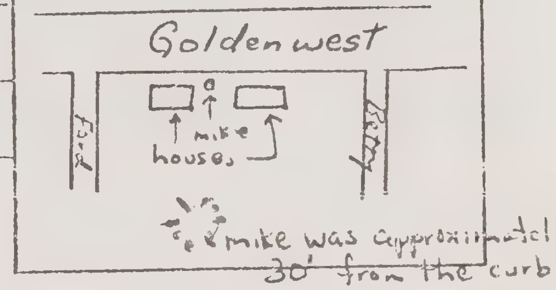
DATE: 10/7/74

TIME OF DAY 11:30 a.m.

SITE LOCATION: Golden West between Betty Drive and Ford Drive.

SITE DESCRIPTION: Residential frontage along arterial.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Automobiles on Golden West at a distance controlled the residual level at 55 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Car passbys were typically 68 to 72 dBA. Sports cars were 74-76 dBA. A school bus passby produced 78 dBA.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 40

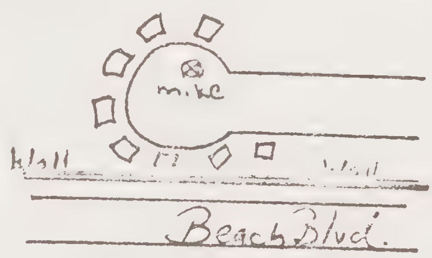
DATE: 10/4/74

TIME OF DAY 5:30 p.m.

SITE LOCATION: Patterson Street

SITE DESCRIPTION: Residential adjacent arterial.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Traffic on Beach Boulevard controlled the residual level at 52 to 54 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): A heavy truck emitted 58 dBA. A four-engine (piston) aircraft produced 68 dBA.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

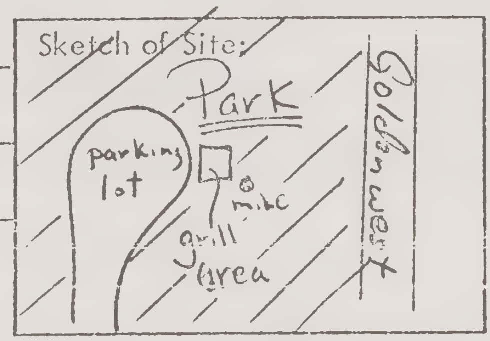
SITE NUMBER: 41

DATE: 9/19/74

TIME OF DAY 11:45 a.m.

SITE LOCATION: Murdy Park off Golden West

SITE DESCRIPTION: Park adjacent arterial.



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): The residual level was controlled by traffic on Golden West which typically produced 54-56 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Fluctuations occasionally reached 60 dBA. A heavy truck accelerating produced 75 dBA. A helicopter passing produced 60 dBA (not overhead).

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 42

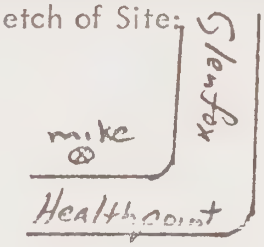
DATE: 10/9/74

TIME OF DAY 6:15 a.m.

SITE LOCATION: Health Point and Glen Fox

SITE DESCRIPTION: New residential area (unoccupied).

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): The residual level was controlled by distant traffic and an unidentifiable "buzz" from afar at 41 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): No single events.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 43

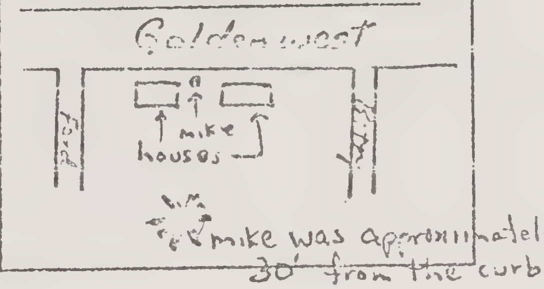
DATE: 10/9/74

TIME OF DAY 6:30 a.m.

SITE LOCATION: Golden West between Betty Drive and Ford Drive (same as Site #39).

SITE DESCRIPTION: Residential frontage along arterial.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Automobiles on Golden West at a distance controlled the residual level at 52 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Typical traffic levels were 68-71 dBA. A pickup truck with noisy tires registered 75 dBA. A bus emitted 80 dBA.

COMMENTS: This was considered a very noisy residential area during early morning hours.

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 44

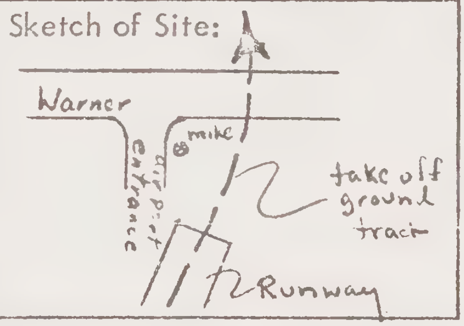
DATE: 10/16/74

TIME OF DAY 1:30 p.m.

SITE LOCATION: Warner at Meadow Lark Airport entrance.

SITE DESCRIPTION: Commercial area under takeoff path of Meadow Lark Airport.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): The residual level was controlled by auto traffic on Warner and aircraft at a distance registering 54 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Two takeoff flyovers of aircraft each emitted 74 dBA. A truck passby on Warner produced 78 dBA. Traffic on Warner typically produced 64 to 68 dBA.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 45

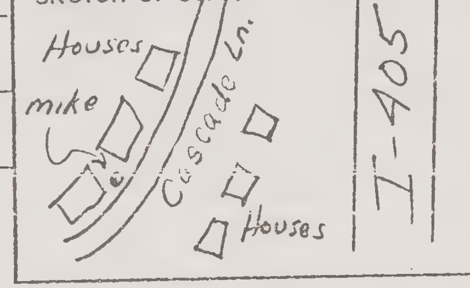
DATE: 10/16/74

TIME OF DAY 12:30 p.m.

SITE LOCATION: 15293 Cascade

SITE DESCRIPTION: Residential adjacent I-405.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Freeway traffic noise controlled the residual level at 54 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Car traffic on I-405 typically ranged from 55 to 60 dBA. Large trucks on I-405 emitted 64, 66, and 68 dBA.

COMMENTS: Approximately 50 foot freeway elevation.

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 46

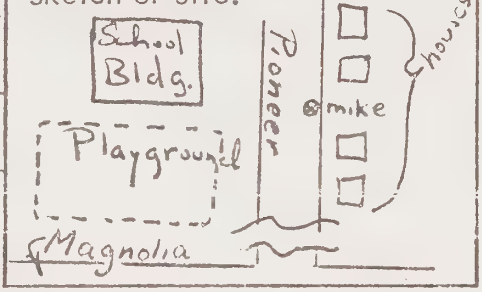
DATE: 10/16/74

TIME OF DAY 2:15 p.m.

SITE LOCATION: 9112 Pioneer Street

SITE DESCRIPTION: Residential adjacent elementary school.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): The residual was controlled by traffic and children at the school registering 52 to 58 dBA. Lowest levels reached 52 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): A bus on Magnolia emitted 59 dBA. A motorcycle on Pioneer emitted 82 dBA.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 47

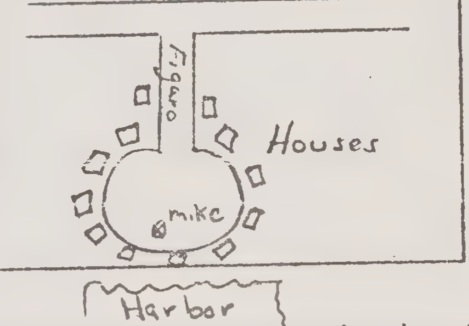
DATE: 10/16/74

TIME OF DAY 1:15 p.m.

SITE LOCATION: Figaro Street (Huntington Harbour area)

SITE DESCRIPTION: Residential adjacent harbor

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): The residual level was controlled by a large boat in the harbour at 54 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): No single events.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 48

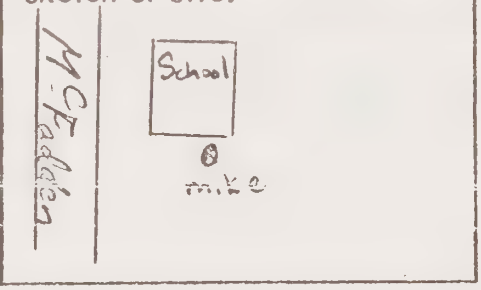
DATE: 10/16/74

TIME OF DAY 12:50 p.m.

SITE LOCATION: School at McFaddan and Andaman Lane

SITE DESCRIPTION: School in quiet residential.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): The residual level was controlled by distant aircraft. Children and miscellaneous sources varied from 48 to 52 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Two truck passbys on McFaddan each emitted 58 dBA.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 49

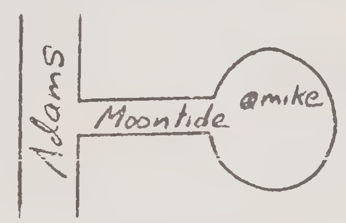
DATE: 10/16/74

TIME OF DAY 2:00 p.m.

SITE LOCATION: Moontide Circle

SITE DESCRIPTION: Residential in vicinity of arterial.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): The residual level was controlled by traffic on Adams and distant aircraft registering 46 to 48 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Typical traffic levels on Adams were 50-52 dBA.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

SITE NUMBER: 50

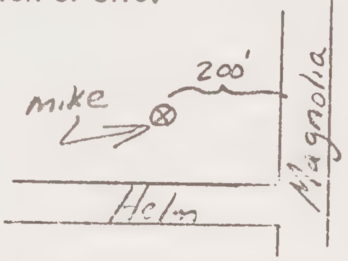
DATE: 10/16/74

TIME OF DAY 3:00 p.m.

SITE LOCATION: Magnolia at Helm

SITE DESCRIPTION: Agricultural property adjacent arterial.

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): The residual was controlled by traffic on Magnolia. Lowest levels reached 50 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Typical traffic levels were 57 to 63 dBA.

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

OIL WELLS

SITE NUMBER: A

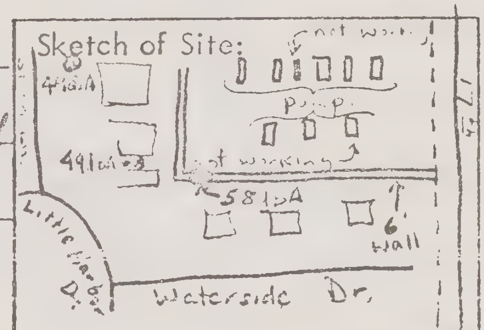
DATE: 2-26-75

TIME OF DAY: AM

SITE LOCATION: Near Intersection of Waterside Dr and Stern Ln. in the "Beach Walk" Development

SITE DESCRIPTION: Residential Area near oil pumps (Standard Oil, "L" Island)

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): Small aircraft & traffic at a far distance controlled the residual at 49 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level):

COMMENTS: Noise readings above the 6 foot wall registered 58 dBA while readings between houses (measured approx 30' from the wall) registered 49dBA. All oil pumps were powered by electric motors.

WYLE LABORATORIES

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH OIL WELLS

SITE NUMBER: B

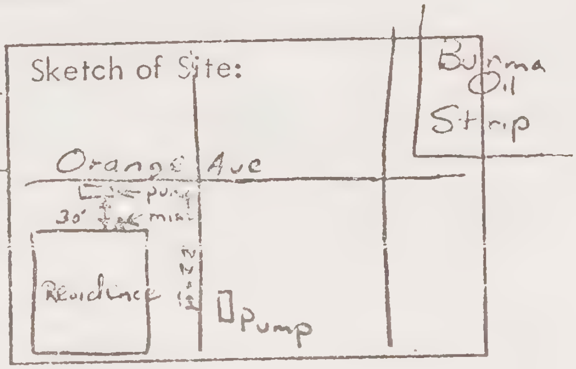
DATE: 2-26-75

TIME OF DAY PM

SITE LOCATION: Orange Ave & 22nd St

SITE DESCRIPTION: Residential Area Adjacent a Single Oil Pump & in Vicinity of Burma Oil Strip

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): The residual noise level was controlled by the oil pump near the microphone (approx. 30') and the drilling operation on the Burma Oil Strip at 60dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Automobile passbys on Orange Ave registered 66 to 70 dBA.

COMMENTS: It was felt the residual level would decrease several decibels if the drilling operations ceased.

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

OIL WELLS

SITE NUMBER: C

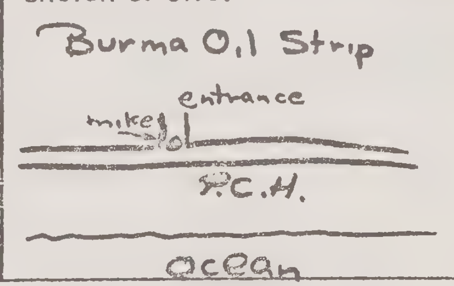
DATE: 2-26-75

TIME OF DAY PM

SITE LOCATION: Entrance to Burma Oil Strip on Pacific Coast Highway

SITE DESCRIPTION: Industrial Area near Highway

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): The oil pumps controlled the residual at 70dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): Traffic on PCH registered levels of 72 to 80dBA

COMMENTS:

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

OIL WELLS

SITE NUMBER: D

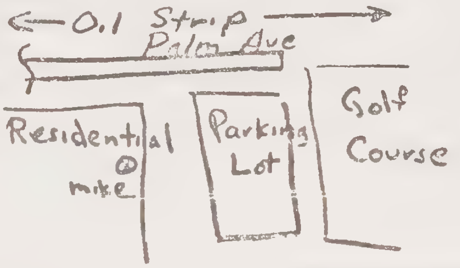
DATE: 2-26-75

TIME OF DAY PM

SITE LOCATION: West end of Palm Ave (near the golf course)

SITE DESCRIPTION: Residential Area near Burma Oil Strip

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): The Residual noise level was controlled by oilpumps, miscellaneous engines and compressed air being released on the oil strip at 57 to 64 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level):

COMMENTS: The sulfur odor at this location was very offensive.

NOISE LEVEL DATA SHEET FOR HUNTINGTON BEACH

OIL WELLS

SITE NUMBER: E

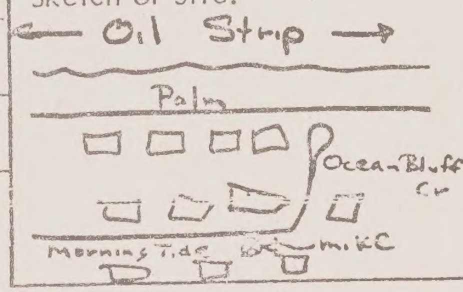
DATE: 2-26-75

TIME OF DAY PM

SITE LOCATION: Ocean Bluff Cr. at Morning Tide

SITE DESCRIPTION: Residential Area near oil strip

Sketch of Site:



DESCRIPTION OF BACKGROUND RESIDUAL NOISE (Give type source, level and degree of noise level fluctuation): The residual noise level was controlled by miscellaneous noise from the oil strip at 53 dBA.

DESCRIPTION OF INTRUDING SINGLE EVENTS (Give type source and Noise Level): A small aircraft passby emitted 60 dBA. Pulsating air being released at the oil strip registered up to 66 dBA.

COMMENTS: The microphone was shielded from direct line-of-sight to the oil strip by houses.

CITY OF HUNTINGTON BEACH
P.O. BOX 190 DEPARTMENT OF DEVELOPMENT SERVICES CALIFORNIA 92648